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The
Geographical Journal.

No. 6. DECEMBER, 1903. Vol. XXII.

EXPEDITION TO CAUPOLICAN BOLIVIA, 1901-1902.*

By Dr. JOHN WILLIAM EVANS.

I left Southampton on June 26, 1901, in charge of an expedition despatched by Sir Martin Conway to explore the district of Caupolican and the adjoining region to the north-east of the Andes of northern Bolivia. The *personale* of the party consisted of, besides myself, Mr. Gerard N. Watney, civil engineer and surveyor; Mr. John Turle, of the Redruth College; and Mr. R. S. Williams, of the New York Botanical Gardens, Bronx Park, New York City. Many of the surveying and meteorological instruments that we took with us were lent by the Society.

We arrived in La Paz on August 13, and were furnished by the Government with letters of introduction to the officials in the region we were to visit, and other facilities. We left again on the 26th for Sorata, which we reached three days later.

There are two principal routes from Sorata across the Cordillera. One, by Tipuani, follows a transverse valley which commences immediately to the north-west of Illampu and runs north-eastward to Huanay,† at the confluence of the river Tipuani with the Mapiri. The other, which we took on this occasion, lies further to the north-west, and skirts the great Sorata-Mapiri transverse valley for some distance.

We left Sorata on September 8, and ascended the Ticunhaya spur, on the foot of which the town stands, to the point where the tracks diverge—to Tipuani and Huanay on the right, and to Puerto Mapiri

* Read at the Royal Geographical Society, June 22, 1903. Map, p. 724.

† Or Guanay. Indian place-names are spelt in this paper in accordance with Spanish orthography; *hu* is sounded like *w*, and *gu* before *a* and *o* has usually the same sound.

on the left. Following the latter, we passed over Cruz-pata, a shoulder of the Cordillera, and found ourselves high up on the south-eastern side of the commencement of the great transverse valley to which I have already referred. The slope, steep in the higher parts, is more gentle lower down, but again becomes abrupt close to the river, which flows out of sight in a narrow gorge. The track continues for some distance more or less horizontally along the mountain-side, and then, passing a ridge of slaty rocks at a point known as Chuchu, at a height of 14,900 feet,* enters the upper part of one of the tributary valleys of the river Tipuani. Some of the hollows at the foot of the slopes are occupied by mountain tarns. Ascending again, we reached the pass of Llachisani at a height of 15,435 feet, on a slaty ridge of the same character as the last. We now descended, following the course of another tributary of the Tipuani flowing in a deep valley to the north-east. The gravel in the bed of the stream is auriferous, and at some points the boulders have been piled up in walls on either side to clear the way for placer mining. Gold-bearing quartz also occurs. The river unites at Ingenio with the Yani, which flows south-east towards the Tipuani valley. The scanty vegetation of the Cordillera has by this time given place to cultivated fields, and at Ingenio and Yani (11,960 feet M.C., just above the junction of the rivers) are a considerable number of houses.

A short distance down the combined valley the track turns up a lateral ravine, and ascends its northern slopes to the ridge of Ticata, which, at an altitude of 13,380 feet M.C., forms the watershed between the Tipuani and the Mapiri. It follows this to the south-east for several miles, and then, after descending a break-neck path known as the Tornillo, or screw, leads north-eastward along the line of hills separating the Rio Pauchinta and Rio Chiñijo from the Coriaguira. The route is a laborious one, every summit being ascended and descended in turn. From some of these magnificent views were obtained to the north-east; the road to be traversed could be seen nearly to the Rio Mapiri, and beyond, ridge after ridge of hills was visible, running like the Cordillera Real itself from north-west to south-east.

As lower levels were reached, the slates began to show signs of decomposition into soft red material, which appeared to be identical with the laterite of India, while the climate became more genial,

* Most of the altitudes given in this paper are calculated from the difference between the aneroid readings taken by members of the party and the readings at La Paz. They can only be considered as rough approximations. Allowance has been made for variation in index error due to continued exposure to low pressure. At the time of our second visit to Juliaca the error was as much as −0·59 of an inch, but at Pará, on my return journey, it was comparatively small. The altitudes followed by the letters M.C. are taken from Sir Martin Conway's map. (9)

and we passed several small farms where crops are grown to supply the rubber-collectors in the valleys below. They also serve as sanatoria, for they are comparatively cool, and, in the matter of health, all that could be desired. From one of these, known as Villa Bella, a side track runs off to Tipuani, but it was said to be in a bad condition. From the last hill a rapid descent and a short journey through tropical vegetation brought us to Puerto Mapiri (1610 feet M.C.),* on the right bank of the river of the same name. This village consists of a number of huts constructed of a framework of unhewn timber, with walls filled in with small poles about half an inch apart, so as to leave a free current of air. The largest huts are used as storehouses for the merchandise, which is here transferred from mules to rafts and *vice versâ*.

A stay either at Mapiri or Charopampa, at the other side of the river, of more than a few hours is apt to result in an attack of malaria. At the latter, where we stayed, I noticed the presence of *anopheles*, the mosquito which has been shown to act as carrier of the *plasmodium malariæ*. Although the connection between the mosquito and the disease is still disbelieved by the Bolivians, it has long been an article of faith among the Indians of the low country. The Aimará Indians who undertook the transport of our stores from Sorata to Mapiri were quite aware that it was dangerous to spend the night in a malarious locality; and insisted on stopping in the afternoon at La Vacqueria, one of the last hills, so that they could descend to the village early in the morning and return to their camp before nightfall.

The Indians who form the crews of the rafts belong to the Leco race, entirely distinct in language, character, and features from the Aimarás of the Cordillera. Most of them live near Huanay, but they also constitute the population of Aten.†

We left Charopampa with part of our stores on two *callapos* (pr. kaiyápos), a name applied to a combination of two or three small rafts, or "*balsas*," on September 26, and, camping one night on a river-beach or *playa*, reached Huanay early the next day. At Mapiri the hills of slate and subrecent conglomerate leave a considerable extent of lower ground near the river, but further on they soon close in, and the stream runs in a narrow uninhabited valley till Huanay is approached, when it opens out again, and small plantations and huts are seen from time to time by the river-side. The hills on both sides are exploited for india-rubber.

Huanay ‡ stands on the right bank of the river, on the alluvial land just above the mouth of the Rio Tipuani. It is the centre of the river navigation, the port for the Tipuani route across the Cordillera, and an

* The site of a mission founded by the Augustins; transferred to the Franciscans in 1796 ((2), p. 111), but since abandoned.

† They are probably identical with the Indians known as Chunchos or Cambas.

‡ 1400 feet M.C.; formerly a Franciscan mission.

entrepôt for the rubber trade. Malaria occasionally occurs, but is not so prevalent as in the village of Tipuani, which I subsequently visited. Still later, in June, 1902, I travelled from Sorata to Huanay by the Tipuani valley.

This route * passes the Cordillera at a slightly lower altitude (15,220 feet) than the highest point on the track previously described; it then descends to the north-east by a steep funnel-like ravine into the valley the head of which was crossed in the journey to Mapiri; this runs south-east as far as the little village of Ancoma, where a few crops are cultivated at a height of 12,320 feet above the sea.

The rocks between Sorata and the summit, and forming the ridge itself, are identical with those met with on the previous journey. Indeed, the ridge is a continuation of that first passed on the other route, but just above Ancoma enormous intrusions of granitic rocks are met with, which appear to extend southward to the northern slopes of Illampu. Again and again the river, after a fairly level course for a little way, rushes down a mass of naked rock.

The climate rapidly changes; at Tusuaya (or Tuscubaya), a prosperous hamlet with a church, it is already comparatively mild. A little lower at Yoryutta bridge the track crosses from right to left bank, and, after a rapid descent through rocks covered with low trees, enters the forest, while the climate soon becomes warmer. Still lower, near Chuchurapini (9260 feet), the track again crosses to the right bank. The granitic rocks are now replaced by sedimentary rocks metamorphosed by their close association with the intrusive rocks.

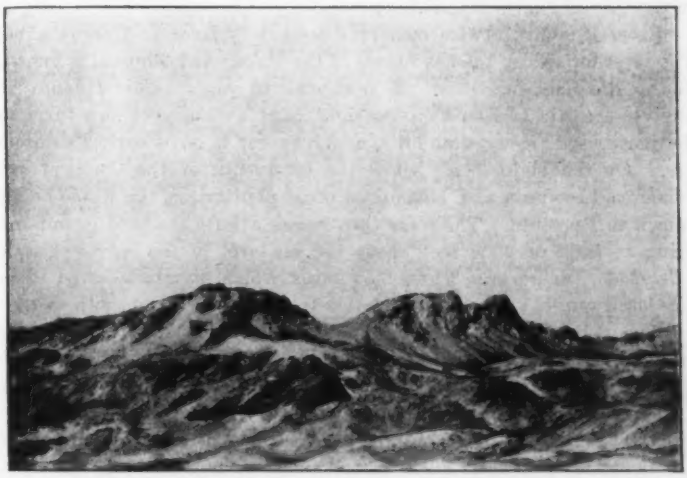
The path continues to follow the right bank for some distance past the hamlets Sumata and Ocara, at no great height above the river, but beyond it keeps high up on the right-hand side, while the river runs far below between steep wooded slopes. Near the path occasional huts and patches of cultivated ground are met with. At the famous *malpaso* of Quilapituni it descends the face of a rugged mass of schist by a series of large rough steps to the level of the river in order to effect the passage of the Rio Quilapituni (4960 feet). At this and other places, mules, though they carry only a hundred pounds of burden, have to be unloaded, and they have been known to fall even then.† Beyond, the path again ascends high up on the hillside, descending subsequently to cross each large river that enters the Tipuani on the right bank.

The track continues very similar in character for a long distance. The huts are generally situated at the few points where water is found high up on the valley side; at lower levels there is no pasture for the mules, and the climate is moist and oppressive. After a time

* Described by Weddell, (14) chaps. xvii. to xxvi.

† It is always advisable to employ porters (*cargadores*) rather than mules by this route.

the metamorphosed rocks give place to slates. These soon show signs of decomposition, weathering in bands to a red lateritic clay, and before long the whole mass of the slates has passed into laterite. In this soft material the traffic has worn a deep channel, so narrow that it is often difficult or impossible for a loaded mule to pass. Beds of alluvial gravel are now frequently met with high up above the river, and sometimes form considerable cliffs. In former times auriferous layers interstratified in these deposits were extensively worked. A little further on the track gains the grassy heights of Paniaula (3415 feet), from which magnificent views are obtained. A long descent to the river follows, and a point is soon reached where



FIRST CREST OF CORDILLERA ON TRACK FROM SORATA TO INGENIO.

the hills recede, leaving a wide and fertile valley; this is followed by a narrow gorge (Encañada de la Cueva), which opens out again as Tipuani (1820 feet M.C.) is approached.

This once busy mining centre has dwindled to very small proportions. There is no reason to believe that the deposits are worked out, but the difficulty in obtaining clear titles is a serious hindrance to the investment of capital. Only a few huts are now standing, and scant traces remain of the former extent of the place. At some points crumbling mud walls may still be distinguished amidst the tropical vegetation, and elsewhere abandoned machinery is rusting in the forest. Malarial fever is prevalent; the climate is very damp, and a chilly wind blows down the valley at night.

A league below Tipuani, at Cangalli,* the main track crosses from the right to the left bank of the Rio Tipuani, passengers and goods being transported by *balsas*. From Cangalli it is possible to descend to Huanay in *balsas*, but this is rarely done. The land-route ascends the hillside on the left, and finally emerges on the lofty Pilone ridge, running south-west and north-east, composed of lateritized shale, where fine views are obtained of the Tipuani valley. From the end of this ridge a long spur runs south-east to Huanay, and in the angle between the ridge and spur is the little village of Munaipata, signifying "pleasant hill," a place-name often used in Bolivia. This village is a kind of sanatorium for Huanay and Tipuani; the Aimará Indians, I may add, refuse to pass the night at either of the latter places, as in the case of Puerto Mapiri.†

From Huanay I twice made the descent by *balsa* to Rurenabaque. The river formed by the confluence of the Mapiri and Tipuani is known as the Rio Caca or Sanes. A few hundred yards below Huanay it receives the Rio Challana on its right bank. The river now turns to the northward among slate hills, which appear to be of early Palæozoic age. On the right bank below the confluence of the Coroico ‡ are numerous Leco huts and abandoned cocoa plantations, the whole being known as Teoponte. The river then passes a lofty range of mountains rising to 5000 or 6000 feet above the sea-level in the narrow Cusali "*Encañada*," or gorge. These mountains, which may be referred to as the Cusali range, extend in a direction from north-west to south-east.§

A short distance further on is a large sandstone rock standing up out of the river, with drawings of men as well as ornamentation carved upon it, which are popularly known as "*el diablo pintado*." Nothing is known as to the tribe by whom they were executed. They may perhaps refer to the rapid "Malaguas" a little below, which presents serious difficulty in some states of the river. These drawings are very similar to those described by Wallace from the river Uaupés, in Northern Brazil (see also (10) p. 157).

After passing Isapuri, another and more dangerous rapid, that of Retama, is met with. It is caused by a ridge of sandstone rocks which are here faulted against the slates. Enormous blocks obstruct the middle of the river. This is usually a formidable obstacle, and many

* A ferruginous conglomerate is generally known in this region as *cangalli*; whether this term is derived from the name of the place, or *vice versâ*, I cannot say.

† For a detailed account of the history of the Tipuani valley by Señor Rumualdo Villamil, see (4) pp. 108–125. The earlier part is extracted from a manuscript of doubtful authority. It asserts that, when the Spaniards reached Tipuani in 1602, they found Portuguese adventurers already there who had ascended the Beni from Brazil. Subsequently, Negro slaves were, it is said, imported by the same route.

‡ Ascended by Weddell, (14) chaps. xxvii. and xxviii.

§ I believe that part of this range north-west of the gorge is known as the Alto de Saihuani.

cargoes have been lost in the passage. It is easiest to pass at high water, but even then large stationary waves below the fall break completely over the *balsas*.

A small outcrop of limestone occurs near Nube, a point at which two streams, one on either side, enter the main river, but with this exception the river runs for a long distance entirely through sandstone. At first it is hard and massive, and rises into considerable hills, but these are afterwards replaced by lower elevations of soft sandstone and conglomerate, both of which are usually red in colour and dip at a lower angle. In one of the earliest cliffs presented by the rocks last referred to, rude representations of the sun and moon have been carved, and are supposed to represent Manco Capac and Mama Oello, the founders of the Inca dynasty. The site of some Leco huts in the vicinity is known as Incahuara (*Inca-wara*).*

Hills of the harder sandstone are again met with near Chiniri, or Sañiri, where the river flows in a deep valley. Below, the softer sandstone reappears and continues till the Caca, after repeated convolutions, unites its waters with those of the large river variously known as the Beni, Bopi, and Rio de La Paz. From Retama downwards the river sands are often auriferous, and traces of gold have been also found in the older conglomerates.

The united stream, which takes the name of the Beni,† flows for some distance to the north-west along the margin of hills of soft sandstone which are the foothills of a lofty mountain range stretching like the Cusali ridge north-west and south-east. At last the river turns suddenly to the north-east, and makes its way first through the soft sandstone ridge and then through the higher range, formed of hard sandstone, in the gorge of Beu. At one point this contracts to a narrow chasm with vertical sides, where the water moves slowly in a deep channel.‡ These mountains may be referred to as the Beu range. Some miles of more or less open valley follow till another range is approached, at the foot of which the Rio Chepite or Sepita joins on the left bank. These mountains, conveniently described as the Chepite range, are pierced by a

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* We stayed for some time in a grove of a tall bamboo-like grass known as the charo (*Gynerium sagittale*) on the left bank of the river, where it turns sharply to the south just below Maquique (see map). Here a long series of aneroid readings gave an altitude of 1130 feet.

† Beni signifies "wind" in Tacana. The river is also known as Dea Manu (man river), Dia or Dea Beni, Guarayuya (river of the Guarayos), and Rio de los Omapalcas or Amapalcas, (1) pp. 1, 14. Manu (Araona), mayo (Quichua), -apo, -api, -ámonas, -ámanas, -ámas, huára (Leco), para, and yuyo (Pacaguara) all appear to signify "river." Jene (Pacaguara) and ena (Tacana and Cavineña) are similarly used, but properly mean "water."

‡ Just above this point there was a dangerous rapid known as El Beu, Veo, or Cruz Tumsi, caused by large blocks which had fallen into the river-bed, but these obstacles were not apparent when I passed (1) p. 3, (3) p. 19, (10) p. 147.

cañon of exactly similar character to the first. The river now emerges into a wide low-lying plain traversed by soft sandstone hills, generally in a north-north-west and south-south-east direction. Distant mountains are visible to the north-west, and to the north-east another range, parallel to those already passed, is seen. Except for the low hills the whole area appears to consist of swamps and forest, which are probably submerged when the river is high.

As the next range of mountains is approached, the river Tuiche, which takes its rise in the Cordillera of Pelechuco, joins on the left. The Peni then traverses the soft sandstone hills, which here also are found at the foot of mountains of harder sandstone, and afterwards passes these latter in an irregular gorge known as Bala.*

Beyond the gorge the river flows for a while through an area of lower hills of softer sandstone. Occasionally a small plantation is seen belonging to one of the residents in Rurenabaque. Except for these and a rubber establishment at Chiniri, the banks of the river from Incahuara to Rurenabaque appear to be absolutely uninhabited. The river flows a short distance to the north-westward at the foot of the soft red sandstone foothills of yet another range, the last outwork of the Andes, and then turns to the north-north-east, and passes through the deep gorge of Susi into the open plain, which stretches without a break to the northward, and until the cataract of Esperanza is reached, 600 miles down the river, no hill over 100 feet in height or true rock is met with.

At the point (about 590 feet above the sea) where the river leaves the mountains behind there are two towns or villages, Rurenabaque, which signifies "a pottery" in the Tacana language,† on the right bank, and San Buena Ventura on the left. These together form one of the commercial centres of the lowlands of Bolivia. Supplies are brought hither not only down the Caca and Beni, but to a less extent by the Bopi.‡ They also arrive overland from Pelechuco and Apolo on the one side, and from the agricultural district of Mojos to the south-east, of which the commercial and official centre is Reyes, on the other.

Rurenabaque and San Buena Ventura are not unpleasant places of residence; they are free from the yellow and black sandflies (Simulidæ) that are such a terrible scourge at most places along the river, and there is no malaria or beri-beri. A phagedœnic ulcer, known as the *carache*,

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* One of the higher summits rises a little to the left of the cañon, and between is a narrow ridge in which there is a small sharply defined depression as if a piece had been broken out. Dr. Heath tells us that the gorge is called Bala because the gap looks as if it had been made by a cannon-ball, (10) p. 145. Señor Ballivian says that the Lecos call it the Espejo (looking-glass, though they probably mean peep-hole), (3) p. 21.

† (3) p. 23.

‡ The total during 1901 amounted to about 130 tons.

is the most serious complaint. The inhabitants are mainly half-breeds and Indians, the latter being partly Napos,* and partly Tacana-speaking Indians from Tumupasa, Ixiamas and San José. San Buena Ventura was formerly a mission of the Franciscans.

In June, 1902, I visited Reyes.† It is reached in seven or eight hours' journey through a swampy forest and rather drier pasture country. Goods are mainly transported by means of carts with large solid wheels drawn by four to six bullocks, along a track which has been cleared to a sufficient width. Reyes is situated on one of the areas that rise slightly above the general level, and are known as islands. The population consists mainly of Indians who speak the

BALSA WITH SHELTER, PUERTO MAPIRI.

Maropa language. It is connected by a waggon-track with Santa Anna on the Mamoré. Large herds of cattle graze in the surrounding region. Formerly horses were almost as numerous, but some fifty years ago they were killed off by an infectious disease known as the *peste* that came from Brazil.

At San Buena Ventura there was great difficulty in obtaining transport to Tumupasa, consequently the whole party could not travel

* Probably a local name for Indians from the Manutata (Madre de Dios) and Orton.

† It lies north-east of Rurenabaque. The first site was on an island now known as Pueblo Viejo, on the west side of the Beni, separated from San Buena Ventura by a small branch of the river, (2) p. 39, citing R. P. Francisco Javier Eder.

together. I left on November 23 on foot, with about a dozen Indian porters (*cargadores*), for whose services I was indebted to the kindness of R.P. Fr. Pablo Fernandez of Tumupasa. These men are cheerful and good natured, but have little idea of consulting the convenience of the traveller. Only one of those with me spoke much Spanish, and I found myself put to considerable inconvenience from want of my stores, the carriers of which went on their way independently. The track followed was roughly parallel to the outer slopes of the Bala-Susi mountains.* About 3 or 4 yards wide had been cleared, but this space was often obstructed by fallen trees; portions were rather swampy, but it was on the whole much better than the road to Reyes. Shelters (*tambos*), consisting of a thatched roof supported by substantial upright pieces of timber, but without sides, were provided in two or three places. I crossed numerous streams flowing from the hills to the plain; their beds were filled with sandstone rocks, angular or partially rounded, and continued for some distance into the forest, terminating at the foot of the gentle slope where the low swampy ground is reached, which is under water during the wet season.

Tumupasa is situated on the higher part of a slope of this character at about 1435 feet above the sea. Close at the back rise angular hills of friable sandstone, which require some care in climbing, as the rock is treacherous. In front the village looks over the forest of the central Amazonian plain, which at first sight, with its wide uniform expanse and unbroken horizon extending through half a circle at a distance of nearly 40 miles, presents a startling resemblance to the open sea.

Tumupasa is a Franciscan mission, and was founded about the end of the seventeenth century, though the earliest entries in the church register date from 1746, (2) p. 41. Its first site was in the valley of the Yariapo, on the other side of the mountains.† The inhabitants consisted of the Indians from the surrounding country.‡ The locality proved so unhealthy that the mission was moved to the present site, which is remarkable for its freedom from disease and insect plagues. The temperature is low for so small an altitude in the tropics. The rainfall is abundant, but the water soon runs off the surface. The soil in the immediate vicinity of the village is so stony that little can be grown in it, but most of the inhabitants have fertile farms or *chacras* in the lowlands at distances varying from one to six leagues. There are about forty houses, besides a well-built church, belfry standing apart, and

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* I use this as a convenient name for the double range of hills immediately south-west of Rurenabaque. Armentia calls it "Ultimo limite de la Serrania," (1) correction to map; President Pando, the "Serrania de Tumupasa," (11) p. 197.

† Its original title was Santissima Trinidad de Yariapo, (5) p. 24. Tumupasa means "white stone."

‡ These were of the Pamaino and Saparuna tribes, (5) p. 6; but Tacanas, Marcanis, Toromonas, Araonas, and Chilliuvos are also represented in the population, (1) p. 5.

a two-storied convent, which is used both as the residence of the missionary and as a school.

A little over 30 miles north of Tumupasa is a somewhat smaller mission—that of Ixiámas *—which was visited by Mr. Watney and Mr. Williams to determine its position and make botanical collections. The route is for some distance nearly parallel to the mountains, and similar to the latter portion of the track from San Buena Ventura to Tumupasa. At a distance of about 20 miles it turns more towards the north, and as it recedes from the mountains a lower level is reached, and the ground, which appears to be often overflowed, is softer and full of mud-holes. Two large open spaces, or *pajonales*, were passed where the rank grass grew to a height of 5 feet.

Ixiámas stands at a height of 730 feet, at a distance of about 6 miles from the outer slopes of the north-western extension of the Bala-Susi range, on a bank of consolidated sand some 40 feet above a stream, the Tacasu, a tributary of the Hundumo, which is gradually wearing it away. All round are stretches of marshy pasture land which support large numbers of cattle. Here and there are slightly raised and drier strips covered with small trees, including the rubber-bearing Hevea. In the rainy season the surrounding country is inundated to such an extent that a loaded mule cannot pass.†

In July and August some of the inhabitants make their way down the Tequeje to the Beni to catch fish. There is a track to the northward to the Manutata‡ by the sites of the abandoned missions of Santiago de Pacaguaras and Carmen de Toromonas, which has been occasionally traversed, (1) chap. vi.; (2) pp. 148–151. President Pando twice reached Ixiámas from the north-west, (11, 12).

The Indians, both of Tumupasa and Ixiámas, speak the Tacana language, which is allied to the Maropa of Reyes, and the idioms spoken by the Toromonas and Araonas of the Manutata and Beni. For a long time the Indians retained many of their ancient rites and customs,§ and even now, in the excitement of the feasts when the crops are sown or reaped, they sometimes worship their ancient deities. There are, I

* Founded about the same time. Its inhabitants are Tacanas, Toromonas, and Araonas, by origin, (1) pp. 5, 14; see also (5) p. 25.

† It is believed that a force sent by the Inca Yupanqui to conquer the low country marched past Ixiámas and Tumupasa to Musu, which has been identified with the district of Mojos. It is possible, however, that Musu may have been a locality on the river Mosoj-huaico or Lanza; see also (1) p. 18. Subsequently, in 1539, Anzurez de Campo Redondo took the same route, and, passing by Zama (Ixiámas, formerly written Ysiamas) and the river Amapalcas (the Beni), reached a large river flowing from east to west, which Colonel Church believes to have been the Rio Grande branch of the Mamoré, (8) p. 145; (1) p. 14.

‡ Viz. "river-father" in the Araona dialect. It is also known as Mayu-tata (with the same meaning), Manu-ena (river mother), Manu-manu (great river), Amara-mayu (snakes' river), and Madre de Dios, (8) p. 146; (13) p. 11.

§ (7) p. 165.

believe, non-Christian Indians (*barbaros*), Tacanas or Toromonas, living in the neighbouring forests, and it is probable that there is an understanding between some of the Christianized Indians and their wilder brethren. In an open grassy area or *pajonale* in the forest near the river Yuriapo, between Tumupasa and Ixiámas, which surrounds a hot spring, there are some huts where both are alleged to take part in the rites of their god, who resides in the double-peaked summit of Caquiahuaca,* which rises some 5000 feet above the sea.

I heard many stories of the dangers to be apprehended from meeting the *barbaros*, but the natives of Tumupasa did not seem to take many precautions in visiting their *chacras* or making other excursions in the forest. The *barbaros* are said to be in the habit of travelling between the lowlands and the mountains of the Tumupasa range near the river Yuriapo. It was close to the point where this route crosses the track to Ixiamas that a Christian Indian woman was killed in 1901. She was one of a party travelling from Tumupasa to Ixiamas, and lingered behind with her child; the latter was carried off. Any murders committed by the wild Indians are attributed, but not always correctly, to the formidable tribe of the Guarayos, or Guacanaguas. In the last century they were known as the Tiatinaguas. At the present time they are usually called Guarayos, but must not be confounded with the Guarayas, a Christianized tribe to the south-east of the Mamoré.† The Guacanaguas profess undying hatred to the Christian Indians. A long time back the relations between the two were quite friendly; indeed, it is stated that some of them accepted Christianity, and formed the mission of Santiago de Pacaguaras.‡ Some of them apostatized, as it is termed, about a hundred years ago, and the mission finally disappeared in 1840. It was probably at an earlier date, when the Guacanaguas used to come in to the *fiestas* at Ixiamas, that the incident arose which gave rise to the feud. One of the Guacanaguas, who was on a visit to Ixiamas, committed some serious offence—theft of sacred vessels from a church, or an outrage on a woman, according to different accounts. His lips, ears, and nose were cut off, and thus

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* (1) p. 46.

† It is, of course, not impossible that the two are related. The names Paiconeca and Paunaca, applied to dialects spoken by some of the inhabitants of Concepcion de Chiquitos, may be other forms of Guacanagua. R.P. Fr. Pablo Fernandez of Tumupasa told me that, so far as he was aware, the only tribe allied to the Guacanaguas in race and language were the Iñapadis, or Iñiparis, (13) p. 12, who live further to the north-east. They are not so irreconcilable as the Guacanaguas, but sometimes unite with them to make war on other tribes. I cannot, however, find any other reference to the Iñapadis. See (1) pp. 22, 34, 46-49; (2) p. 159; (7) pp. 168, 228, 294-296, 308; (13) pp. 17, 67. Guarayo appears to mean fighter, murderer, ferocious savage or outlaw, (1) pp. 40, 49; (11) p. 200; (13) p. 67.

‡ (7) p. 295. If this be so, it is not easy to understand why the mission was named after the Pacaguaras, who are a distinct tribe allied to the Chacobas and Caripunas of the Mamoré and the Madeira and to the Panos of the Ucayali, (2) 159; (7) p. 308.

mutilated he went back to his tribe, who thereupon vowed eternal war against the Christian Indians. Their warcry is said still to be an imprecation against Ixiámas.* They carry banners with the form of a monkey or other animal woven into it, and are the ablest and most determined of the Indian tribes.

Near Tumupasa the mountains appear to consist of two ridges, as on the Beni, though rather closer together. Between them, and on the south-western slopes of the inner south-western range, the harder sandstones are overlaid by soft red sandstone, similar to that already mentioned as forming the foothills in other places. The principal

BALSAS DRYING, PUERTO MAPIRI.

streams that reach the great plain appear to have their origin in the higher south-western range and flow out through gorges in the north-eastern. There is one stream, the Tejámanas, that takes its rise to the south-west of both ranges, which it traverses in a broad valley on its way to join the Rio Tequeje.

I left Tumupasa on December 23, ascending the stream that flows past the village and takes its name, to a point named Sadiri 2600 feet above the sea, at the entrance of the col in the south-western ridge by which the track passes.† After an awkward descent over slippery clayey

* This was the story told me, but it is probable that the incident really happened to the Toromonas and Araonas, (1) p. 46.

† At this point is a tumulus, which may mark the burial-place of an Indian chief.

soil, the route continues westward through the forest, over Yuroma hill to the little plateau on which stands the mission village of San José de Chupiamónas,* about a mile and a half from the left bank of the Tuiche, 425 feet above it, and 1515 feet above the sea. The plateau is composed of a conglomerate of large rounded pebbles of quartzite and other rocks, auriferous in places, resting on red shaly sandstone. A little below the village is a small lake used for washing and bathing, which has no visible outlet. To the south-west there is a magnificent view of the Eslabon mountains, in the intervals in which the still higher summit of Huaina Jatunari may be seen.

The village consists of a large church, a belfry with two or three bells, and a convent of a single storey, with about twenty huts, most of them arranged round a square grassy plaza. A certain amount of ground has been cleared round the settlement, but the forest is already in a fair way to regain much of what it had lost. Few crops are grown on the plateau itself, but there are numerous *chacras* on lower ground, especially on the other side of the river a little downstream. In these all the inhabitants have huts, where they spend the greater part of their time, rarely returning to San José, except on Sundays and feast days. From a point on the north-west margin of the plateau a view is obtained of the course of the Tuiche nearly as far up as Buturo. Several larger expanses of high ground are visible north-east of the river. On these there are fertile strips of open country which were once cultivated. One, known as Turucuchi, is between the rivers Sachianu and Tachiapo, and another lies between the Tachiapo and the Pavi, which enters the Tuiche about 1½ miles above San José.† But these have all been abandoned on account of the dangers from the *barbaros*, who are increasing in numbers in this region, having been disturbed in the low country by the rubber-collectors. In the wet season they keep to the hills and do not cross the Tuiche, but when the river is low even the *chacras* on the other side are not safe. About a year previous to my visit, two San José Indians were killed on the Rio Pavi; the *barbaros* stripped them of their clothes, which they tore in their hurry and made off at once, and the river Pavi is now rarely passed by the Christians.

San José was originally founded by the Franciscans in a pajonale or open space near the mouth of the river Esiliamas, a tributary on the right bank of the Tuiche above the Sachianu. This was found to be unhealthy, and the mission was shifted to one of the pajonales near the river Tachiapo. Subsequently, probably on account of the *barbaros*, it was transferred a second time to a place called Bihua (*Biwa*) on the Tuiche,

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* Sometimes written Uchupiámas or Uchupiamonas, (1) p. 4, 22; (5) p. 24.

† The Tachiapo rises near the source of the Tejámanas. R.P. Fr. Comas, a former missionary at Ixiámas, is said to have reached San José in one day, but it is uncertain where he crossed the mountains.

below the *chacras* above referred to,* and later on another move was made still further downstream. The next site was on the Chupiamónas, which flows into the Tuiche on the right a little higher up than San José. It was from this locality that the mission took the latter part of its name. This also, like some of the previous sites, proved very unhealthy, and the mission was moved to the border of the little lake below the present site. This was not a success, and when the present padre Señor Bernardo Clerici came, he found only three or four huts and no church. He brought the village up to its present position, which is in every way satisfactory. The only drawback is the fear of the *barbaros*, on account of whom the inhabitants are anxious to remove to a fertile site down the river near the mouth of the river Eslabon, but have hitherto been dissuaded by the *padre*. In the matter of health at least the change is not likely to be a favourable one.

The original inhabitants were nearly exterminated by an epidemic. Their language, which was distinct from those of adjoining tribes, has now disappeared, (1) p. 5. The present population speak partly Tacana and partly Quichua, and are of mixed race, some coming from the Tumupasa side, and others from the direction of Apolo. I was much impressed by the good results of the work of the Franciscan fathers at Tumupasa, Ixiámas, and San José.

From the *chacras* below San José we descended the Tuiche in a *callapo* of two *balsas* with Señor Valdes of San José and some Indians, including the so-called *maestro*, or schoolmaster,† and his wife and child. The river at first winds from side to side of a valley between hills of red sandstone, capped by coarse conglomerate, which is often auriferous like many of the river sands. In some places trunks of trees are seen in the sections of the ancient conglomerate in the cliffs. These are lignitized, and have given rise to rumours of the existence of coal in the district. After a time the hills recede, and the river runs through a swampy plain, which is continuous with that of the Beni. There are no more rapids, but the river is obstructed by aggregations of tree-trunks. We reached the mouth of the Yariapo three days after leaving the *chacras*. At this point on the right bank of the Tuiche, several *apostados*, Christian Indians who had reverted to savagery, established themselves some years ago, and occasionally attacked and killed those travelling by *balsa* on the river, and took possession of their clothing. An expedition was sent from San José against them; the two men were killed, and the women and children taken prisoners.

The *maestro* and his family continued their journey in one of the *balsas* down the Tuiche and the Beni to Rurenabaque, which they

* Between the crossing and the *chacras* the grinding-stones of an ancient Indian village belonging to pre-Christian days can still be seen.

† He teaches the boys chanting, and assists in keeping the church and its contents in good order, but his chief fame is that of a hunter.

reached the next day, while the rest of us ascended the Yariapo. With great difficulty we took our *balsa* 3 miles up the river, to a point where the land was higher and the river swifter and shallower, so that it was impossible to get it any further. We continued our journey through the forest, following the stream along stretches of sandy beaches and through thickets of low shrubs, sometimes clambering over tangles of tree-trunks brought down in flood time. Further on low hills with red sandstone cliffs appeared on the right bank. On the third day we reached the road from Tumupasa, and so returned to San José, not without having suffered some inconvenience, as our Indian carriers had deserted us on the river to hunt wild pig in the woods.

From San José we travelled across the mountains to Apolo. Watney and Turle went by the ordinary route by Eslabon and Jatunari, while I, with the botanist and Señor Valdes, decided to travel by the less frequented route by Ipurama, which branches off to the right about 7 miles from San José. The original route, on leaving San José, crossed the river Tuiche a little above the Rio Chupiamónas, and then ascended the valley of that river, but, owing to the proximity of the *barbaros*, it has now been altered, and crosses the Tuiche about half a mile lower down, at a height of 1090 feet above the sea, and then continues to the valley of the Chupiamónas. We stopped the night at Lumalio, a little *pajonale* on some high ground at the edge of the valley of the Chupiamónas, near a ridge of rock (1525 feet), where a fine view was obtained of the Bala-Susi mountains for nearly 100 miles, including Caquia-huaca and the Bala mountain itself near the Beni. Below, a bird's-eye view of the forest occupying the floor of the Tuiche valley was obtained. In it were two clear-cut elliptical *pajonales*. The origin of these open spaces is very difficult to determine. I have examined a good many in the forest near Tumupasa, on the road from Rurenabaque to Reyes, near San José, and in the region of the lower Beni. In many cases there seems nothing in the nature of the soil to account for the difference in the vegetation. It may be suggested that they represent ancient clearings by the Indians, but in that case it is difficult to see why they should not become rapidly overgrown like most neglected clearings made in recent years. My own suggestion would be that there is a fungus, or other organism, whose growth kills the trees, and that this spreads out from a centre, destroying them as it advances. It is remarkable that the few trees that are seen within the borders of a *pajonale* are usually feeble and sickly in appearance.

From Lumalio we ascended the Chupiamónas valley, repeatedly crossing the river, which was no easy matter, as it was full of large fragments of rock, among which the mules stumbled badly. Two or three miles up is the river known as Kerosinmayo, from the supposed existence of a petroleum spring. It was, I was told, inaccessible when I passed, as it was covered by the river, which was high.

Between the Chupiamónas and its tributary the Iridia, at a height of 1665 feet, is the little grassy glade of Cuquiplaya, the name being derived from the *cuqui* or *sauba* ant. From this point the two routes separate, the road ordinarily used continuing up the valley of the Chupiamónas to Eslabon. The other is known as the Baccarese road, from a Señor Baccarese, who originally had it traced out to facilitate the exploitation of the cinchona bark. This track is now practically abandoned, except by those taking cattle from Reyes or Ixiámas to Apolo, who use it because, being less frequented, there is more pasture available. Leaving Cuquiplaya, it rapidly ascends till at Aguamilagro* it is 3940 feet above the sea. Here an excellent view is obtained of the

CALLAPO AT ISAPURI WITH TURLE, WATNEY, AND LECO INDIANS, CUSALI MOUNTAINS IN THE DISTANCE.

Bala-Susi mountains on the one side, and the ridge broken by the gap of Pensamiento or Ucumari,† by which we were subsequently to pass, on the other. The road ultimately descends to the valley of the Esiliámas, or San Juan, one of the more important affluents of the Tuiche. Here cinchona bark is still gathered by the inhabitants of Ipurama. We then ascended successively the valley of the Tori and that of its tributary the Huancané—the last characterized by excessive humidity; not only were the trees draped by long moss, but even the fronds of the ferns were overgrown with it. We now followed a steep

* Probably a corruption of Agua de milagro.

† The native name of the black bear.

path up to Ucumari, where many cattle are said to lose their footing in the ascent and fall into the valley below. No sooner, however, had we passed the col (about 5070 feet above the sea) than we left rain and clouds behind, and the character of the vegetation entirely changed. Instead of tall trees and thick undergrowth there were low bushes and grass covering the hillside; even at a lower level there were only patches of wood here and there, and most of our route down the mountain-side was in quite open ground.

Ipurama itself consists of six or seven scattered huts at a height of 3810 feet above the sea, and about 290 feet above the river of the same name, another tributary of the Tuiche. Its inhabitants are of Indian blood, and they are akin to those of San José. They appear to speak mainly Quichua, the language which has given most of the place-names in the neighbourhood. Altogether the settlement cannot number more than four and twenty persons, and they are the only population in the whole of the beautiful, fertile, and generally healthy band of country between the Bala-Susi range and the Apolo district. There are not even any wild Indians, with the exception, perhaps, of a few *apostados* away to the south-eastward beyond the Eslabon river. The *barbaros* on the Tuiche never make any attempt to approach the settlement. The little community is practically self-sufficient. All tropical and most temperate crops and fruit can be grown in the neighbourhood. Occasionally they carry cinchona or crops into Apolo to sell, and there purchase the few products of civilization that they need.

To the left of the road from Ucumari to Ipurama, high up on the brow of the hillside, is a perforation of the rock, a reddish false bedded sandstone. The hollow is about 30 feet high, 80 broad, and 150 long, with 40 feet of rock above. The roof exactly resembles a slightly skew brick railway bridge with a rather flat arch. Even from Ipurama it is possible to see the sky through the cavern.

From Ipurama we descended to the river through the thick forest that clothes the lower part of the valley. On the way we passed a cottage near a highly ferruginous spring. Here lived a family of three or four, most of whom suffered from goitre, which none of the other inhabitants of Ipurama appear to have contracted. Goitre is occasionally seen among the outer eastern hills of the Andes, but never so commonly as in the highlands of Brazil.

The river was crossed with some difficulty, and the track continued through thick forest slowly ascending till at Tigrepata * a height of about 5025 feet above the sea was attained. The trees here were covered with an extraordinary growth of moss, so the climate is probably a very damp one. Further on we reached a height of 5850 feet, where the country became rather more open. A short

* Pata signifies "hill."

descent followed to a shelter or tambo at a place called Paraiso, near which three or four streams unite to form the river Ipurama at a height of 5370 feet above the sea.

From Paraiso the track quickly rose till at a height of 5620 feet tall trees became scarce though there was still a great deal of thick bush. At 6100 feet this gave place to bracken. At Pujyuyoj a height of 7010 feet was reached, and soon after the grassy rounded summit of Giteranipata came in sight, and proved to be at a height of about 7460 feet above the sea. From this point it is possible to see at one time a long stretch of the Bala-Susi mountains, the nearest point being about 50 miles away, and of the Cordillera Real, at a distance of about 100 miles. Illimani, Illampu, and Ancohuma, as well as Caquiahuaca, can easily be seen, and many nearer summits. Unfortunately, when I passed the view was obscured by drifting mist and rain.

From Giteranipata the road makes a sharp descent into the forest, but gradually rises, and is soon in open country again. As the undulating downs of San Antonio (6240 feet) are approached it passes through wide tracts of heather succeeded by grass land. In nearly every case where the rock was exposed to view it was more or less decomposed or lateritized to a yellowish or reddish clay. The road then descends to the river Jabutretuti, where it rejoins the eastern or old road. The name given to this stream signifies "looking at one another," and refers to the fact that those descending from one side of the valley can plainly see those coming down the other side. A little to the right of the road is a cottage where an Indian family reside, the first inhabited place after leaving Ipurama, while the older road runs through entirely uninhabited country from the Tuiche to the Jabutretuti.

I am indebted to Mr. Watney for some notes on this road. As we have seen, it separates from that which I followed at the junction of the Iridia and Chupiamónas. It then continues to ascend the valley of the latter, which it crosses repeatedly. At last the river is left behind, and a steep ascent in thick mud follows. After crossing a deep valley * the track rises to the Eslabon ridge (4015 feet), beyond which is the river of the same name,† about 2 yards wide. It flows into the Tuiche not very far from its mouth. Ascents and descents follow till Macho Jatunari is reached at a height of 4940 feet above the sea; the road then passes down to the Rio Hondo flowing to the south-east, but I cannot say whether this is identical with the river of the same name which enters the river Beni above the Tuiche. From this point the road improves and passes over comparatively low ground thickly wooded with palm trees, which were hardly seen elsewhere on this journey, to Mamacona, where there were formerly some inhabited huts. Thence it

* The small stream Apadahua (*Apadawa*) that crosses the road at this point is said to flow into the Rio Esiliamas.

† Also apparently known as the Sipima, (7) pp. 228, 229.

gradually ascends till at the summit known as Pajonale Grande about 7095 feet above the sea the travellers were fortunate enough to get a fine view of the snowy mountains of the Cordillera. After descending again into the forest they emerged on to lofty open country, and came in sight of the Ipurama track.

Beyond the Jabutretuti other streams were met with flowing like it to the westward. The chief of these are the Turnia and Tori, both with steep sides, especially the latter, where the descent over slippery decomposed shale to the river was somewhat difficult. Ascending the other side the track climbed the slope of a lateral valley up to a grassy plateau 6065 feet above the sea, which sloped gently down to the edge of the deep valley of the Machariapo, another tributary of the Tuiche. When we crossed there was little current, but the water was almost too deep for fording. The ground on the other side was higher, standing about 5925 feet above sea-level. A long descent followed, which was rendered very troublesome by the greasy state of the ground. Here also the rock was mainly composed of shale altered to a stiff clay, which the rain made extremely slippery, so that it was difficult for man and beast to keep their footing. The slopes were covered with grass, on which a few cattle were feeding; they are not bred here, but are brought from Reyes or Ixiámas. Occasionally huts were passed. All these high grassy downs are collectively known as Jatuncama.*

Descending at last a sandstone escarpment, we came into a broad valley 3 miles wide running west-north-west and east-south-east, with lofty hills and mountains rising to a height of 7000 or 8000 feet above the sea on the other side. The few small streams we crossed flowed eastward, and, as we afterwards learnt, ultimately joined the Rio Aten that enters the Mapiri above Huanay; but the watershed was close at hand to the north-west, beyond which the waters join the Machariapo and ultimately reach the Tuiche. The surface of the valley was covered with only scanty verdure, for the rainfall is less than elsewhere in the district, and the altitude exceeds 4500 feet. Soil there is little, except in the depressions, and in many places bare tracts of red lateritized shale are exposed to view. There were hardly any trees, a striking contrast to the landscape to which we had been so long accustomed.†

We continued our journey to the southward obliquely across the valley to the town of Apolobamba, usually known as Apolo.‡ It is

* Sometimes written Alto cama, as if it were Spanish, meaning "high bed."

† I was told that there was formerly a certain amount of forest in the Apolo valley which was all destroyed by the early settlers. The so-called cedar used for the woodwork of the church was obtained from the immediate neighbourhood.

‡ Apolo was founded in 1615 by Pedro de Legui Urquizo, Governor of Larecaja, under the name of N.S. de la Concepcion (or de Guadalupe) de Apolobamba. He was harassed by the Lecos, and abandoned it, but reoccupied it a year or two later. Subsequently he attempted to settle the country to the northward, inhabited by the

situated near the mountains on the south-west side of the valley at a height of 4550 feet above the sea, on fairly level ground traversed by two small streams that unite below the town.* At ordinary times these are insignificant in volume, but when in flood they become powerful torrents. They are crossed here and there by rough wooden bridges covered with brushwood, which, however, can scarcely be trusted with a loaded mule. The town is regularly laid out in squares and streets at right angles, but these are interrupted by the streams, and it is not every street that has a bridge. The houses, some three hundred in number, are constructed of *adobe*, and only one is of two stories. There is a large church containing elaborate wood carvings. The inhabitants consist of a few Bolivians, numerous cholas

RIO BENI, PASSAGE OF BEU RANGE.

or half-breeds, and Indians. The original language of Apolo and the immediate surroundings was an Indian dialect known as Lapa-lapa or Lapucha, because the word *lapa* enters into the formation of the majority of the personal pronouns, and is therefore frequently used in conversation. The idiom, which does not appear to be allied to any other dialect spoken in the neighbouring region, is now however approaching

Agua-chiles (probably identical with the Siliamas, who derive their name from the river Esili-amas, *s* and *ch* being frequently interchanged, see *ante*, p. 607). He died of malaria at Calacoto. His followers were afterwards defeated by the Lecos in an expedition to the south, and Apolo was again deserted till the arrival of the Franciscans in 1682, (5) pp. ii., 11–14, 22–24; (2) p. 41. The name Cerros de Aquachile is sometimes applied to the mountains lying between Apolo and San José, and meeting the Beni in the gorges of Beu and Chepite, (1) pp. 4, 17, 18.

* The first site was close to the "Cordillera de Cola-pillosa," said to be rich in silver. The southern slopes of Jatuncama are reputed to contain silver, but we saw no trace of it, (5) p. ii.

extinction, being replaced by Quichua. Spanish is widely spoken, especially among the men, but there are many in the surrounding country who are quite ignorant of it.

The trade of Apolo is mainly connected with the exploitation of rubber in the country lying between it and the Mapiri and Caca, but the trees are smaller, and the produce from each tree is stated to be much less than in the low level plains of the Beni and Manutata (Madre de Dios). Concessions of rubber country have also been obtained to the north of Apolo on the Rio Mosoj-huaico or Lanza and Rio Pando.

Little cultivation is carried on round Apolo except in the hollows near the streams. Tropical produce is grown in the valleys of the Machariapo and Tuiche near Buturo. The rainfall in the Apolo valley, though not inconsiderable, as the meteorological notes given below will show, is much less than in the hills on either side, where it was often raining heavily when there was no fall in the town itself.

In some places the valley is crossed obliquely from side to side by ridges surmounted by huge blocks of friable sandstone, which rest irregularly on the shales. The presence of these sandstone masses appears to have protected the shales beneath from erosion, and so caused the formation of the ridges. It is difficult to say how the sandstone was brought into its present position. Possibly it may be all that is left of the *débris* brought down by mountain torrents that once descended from the hills on the south-west.

We made Apolo our headquarters from the middle of February till April 24. During this period we visited Aten, about 7 leagues distant. After descending the Apolo valley south-east for some distance, the track winds in and out of the hills which separate it from the smaller valley on the right (south-west), so that we had a good view of the lower part of the Apolo valley, and could see that the Turiapo and Macho Chorisa or Choricha that entered the valley on the opposite side had worn out deep cañons in the former surface; finally we descended on the other side of the ridge to where, at the meeting of the small valley already alluded to and another from the westward, stands the village of Aten. It consists of sixty or seventy huts, some collected near the church by the water side, others scattered about the slopes. The speech is mainly Quichua, but the older inhabitants still use the Rica-rica dialect, which is practically that spoken by the Lecos on the Mapiri and Caca. The climate is rather warmer and more humid than that of Apolo, and the locality less free from sandflies and mosquitoes, though there is little difference of level, for it stands only about 110 feet lower.

A much longer expedition was that to the valley of the Mosoj-huaico or Lanza. We ascended the Apolo valley, reaching a height of 5235 feet, and crossed the watershed into the basin of the Tuiche. A sharp descent brought us quickly down into the forests of the lower Machariapo, which we reached at a height of 3420 feet above the sea.

Travelling along the left bank we passed at short intervals small farms where tropical crops were cultivated. The lower portions of the valley were devoted to sugar cane, mainly grown for the manufacture of white rum. Near a large estate known as Asilla we crossed to the right bank of the river, and then journeyed over the hills to the rice-fields of Buturo (2295 feet) on the right bank of the Tuiche, which even here is a wide river, presenting indeed a much more imposing appearance than at the point where it enters the Beni. A few miles below Buturo is a considerable fall which completely interrupts navigation, and the portion of the river between Buturo and the Rio Pavi is little known and now wholly given up to the *barbaros*.*

Buturo has a warm and humid climate, and, like the rest of the lower Machariapo and Upper Tuiche valley, has an evil reputation for a severe form of malaria. It is quotidian, attacks returning every day in the afternoon, very difficult to shake off, and, like most forms of malaria in Bolivia, produces symptoms of the "bilious" variety, being accompanied by sickness and torpidity of the liver. Sometimes there is intense headache, and the fever is often fatal.

At Buturo we crossed the river in *balsas*, the mules swimming across, not without some difficulty, as the current is strong. We then continued our journey over alluvium covered with lofty forests to the Rio Asariámas,† passing a few cultivated patches on the way. From this point the settled region of the upper Tuiche was left behind, and the only signs of human occupation were the posts or shelters that have been formed along the track in course of formation to the rubber district of the Rio Pando.

We ascended the river Asariámas, which flows in a wide valley. On its slopes are considerable beds of gravel, and it may well have been once occupied by a much larger river. Following up the Rio San Juan, which joins the Asariámas on the right bank, we came to the clearing of San Juan at the junction of two narrow valleys (3255 feet), where a few huts have been erected and crops cultivated to facilitate the formation and maintenance of the forest track. We continued our journey up the smaller valley to the north-north-west, and then ascending its north-eastern slope, crossed a ridge (4540 feet above the sea) which separates the basin of the Tuiche from that of the Rio Cocos, whose waters flow into the Mosoj-huaico, and ultimately reach the Manutata. The track follows and repeatedly crosses the river, where the force of the

* The upper Tuiche was first navigated in 1642 from the village of Mojos, (5) p. ii. About 1670 Gonzales descended the river from the same place. He passed a settlement of the Suquitunia tribe, and having buried his weapons on an island in the river, returned by land with great difficulty, (5) p. 14. R. P. Fr. Armentia believes that he reached the island of Pueblo Viejo near Rurenabaquo, where rusty arms were found by the Jesuits in excavating the foundations of their mission, (1) p. 4; (2) p. 39.

† Sometimes written Asariamo, or Asarasmayo.

current and depth of the water render many of the fords somewhat difficult to pass. Beyond the last, known as Anchoplaya, the track rises to the ridge of Munaipata, along which it runs till it descends to the Rio Mosoj-huaico, at the *tambo* of San Rafael (2310 feet), a mile or two below the junction of the Cocos. The Mosoj-huaico or Lanza is a powerful stream little inferior to the Tuiche at Buturo.*

We returned by the same route, by no means an easy matter, as the almost continuous rain had raised the Rio Cocos, and we were delayed day after day at the fords. Indeed, the valley has the reputation of being exceptionally wet, and it is only in June and July that there is much chance of fine weather. Our mules suffered much from want of proper food, for in the forest there was nothing for them to feed on except the leaves of a small palm and a climbing grass especially plentiful on Munaipata.

We arrived at Apolo on April 9, and on the 24th we left for Pelechuco. Ascending the valley, we turned westward through the hills to Santa Cruz del Valle Ameno.† It is situated on the side of a deep valley at a height of 5025 feet above the sea, has a cool climate, and is the chief centre of the cultivation of coca leaf in this part of Bolivia. It was formerly of considerable size, but has diminished from emigration to the rubber districts, and still more from the excessive death-rate, usually attributed to phthisis due to the insanitary state of the houses destitute of ventilation, but according to others it is largely the result of excessive drinking of the strong spirit or *resecado* (pronounced *resecao*) manufactured on the upper Tuiche. At Santa Cruz I met the sub-prefect, Señor Carlos Franck, a Swiss naturalized in Bolivia, to whom is due what little has been done to develop this part of the province of Caupolican in recent years.

From Santa Cruz del Valle Ameno the road lies over rocks which have been lateritized into a tenacious clay, on which travelling is very difficult. For long distances stone causeways have been formed, in other places thick logs have been laid down to form a corduroy road, but these are almost as objectionable as the clay. At some points a large log is missing, and the animals have great difficulty in crossing the gap, for they can find no footing in the churned-up clay below. The ground gradually rises till a height of 6355 feet is reached. Here a good view

* In 1897 Colonel (now President) Pando descended the Cocos to its junction with the Mosoj-huaico. He there constructed rafts, and continued his journey down the river past the mouth of the Saqui or Tambupata to that of the Asata, which he reached on July 27. He was attacked by Indians on August 5, and his followers were so discouraged that he had to march overland to Ixiamas, which he reached on September 2 after great privations, having passed an unknown river (possibly identical with the Abuyama or Heath), the Madidi and the Hundumo or Undume. For thirty-six days they had no other food than what they could find in the forest or the *chacras* of the *barbaros* (12).

† Founded by the Franciscans in 1720 as capital of the missions, (5) 27-31.

to the south and west is obtained. In front is a long spur which leads to the village of Pata,* to the right is the deep valley of the Tuiche which runs nearly due north, while to the left is the upper valley of the Rio Piliapo.

Pata is situated at a height of 4800 feet above the sea, on the hillside at the end of the spur above referred to. It is inhabited by Indians and half-breeds, who furnish most of the labour employed on the rubber properties that have Apolo for their headquarters. On the other side of the Tuiche, at a much lower level, is the village of Mojos,† situated on the river of the same name.

Leaving Pata, a steep descent follows to the Piliapo, where a tropical

RURENABAQUE, RIO BENI, AT THE FOOT OF THE SUSI RIDGE, THE NORTH-EASTERN LIMIT OF THE ANDES.

climate is again met with at an altitude of 3315 feet. The road then ascends high up on the left bank of the river, and follows its course on the hillside till it unites with the Rio Amantala to form the Rio Tuiche. The track continues along the upper part of the slope on the right bank of the Amantala in the hillside path or "*ladera*" of Jerusalén. Subsequently it descends nearly to the level of the river at Santa Rosa

* Founded by the Franciscans under the name of San Juan de Buena Vista about 1687. The original population included Siliamas and Pamainos. The first site was too cold for the Indians; the second, on the river Piliapo, proved to be very unhealthy. It was then moved to its present position, (5) p. 21; (2) p. 40.

† Not to be confounded with the district of Mojos to the east of the Beni. The site was first visited by Urquizo, who reached it in 1615 from Camata in Muñecas. Subsequently, on his second visit he founded, in 1617, the village under the title of San Juan de Sahagun de Mojos, and built a church for two Augustins that accompanied him. It was subsequently transferred to the Franciscans, (5) pp. ii., 12, 14, 26.

(3170 feet), where the valley broadens out and has every appearance of having once contained a lake now filled up with alluvium.

Just above the confluence with the Rio de Pelechuco,* the Amantala is crossed by a wire bridge of primitive structure, the roadway being of wood covered with brushwood. The track then follows the deep narrow valley of the Rio de Pelechuco or Coran-huata, (5) p. 18. In the valley of the Amantala many small plantations of tropical crops were passed, but in that of the Coran-huata there is no resident population until Pelechuco is approached. It is fed by powerful torrents; the first of them, the Rio Fuerte, is said to be very dangerous in time of flood. It enters the river on the right bank, and is stated to owe its name to a fort that was maintained there by the Spaniards, but the word may equally well refer to the character of the river. This point is about 3635 feet above the sea. The road then ascends high up on the right bank to the *ladera* of Huai-llamacan, at an altitude of 4210 feet, where the climate is refreshingly cool after the heat of the narrow valley below.

A rapid descent follows to the bridge of Paracorin,† at 3810 feet, where the track crosses to the left bank. The bridge is a wooden structure between two rock masses that narrow the stream exceptionally at this point. Here we had a sleepless night from the minute fly known as "polvorina," which penetrates ordinary mosquito netting.‡

For some distance the rock consists of slates with graptolites. It is comparatively free from the effects of laterization. After crossing a little higher up by another bridge at Cule, the road ascends the hillside, reaching, in the *ladera* of Tecalo, a height of 5330 feet. The river is now a mountain torrent with a steep course, so that when the road comes down to its level to pass the Quichara stream, the altitude is still as much as 5160 feet above the sea.

Again the road ascends the slope on the right-hand side of the valley, and the first traces of glacial striations are met with. Further on it crosses a ledge between the successive leaps of the magnificent cataract of the Rio Ignacio, and subsequently descends to the main river, now at a height of 5735 feet, to pass the valley of the Tanuara. Beyond it ascends to 7245 feet; when the snow-clad summit of the peak of Pelechuco comes in sight. The level of the river is again reached near Sant Anna or Callcan (Caican), an abandoned settlement 6950 feet above the sea. From this point the track closely follows the river, the diminished vegetation and the fact that the rocks are no longer

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* This neighbourhood, known as Amantala, is said to be malarious. Its altitude is 3380 feet.

† This appears to contain the same root as Coran-huata.

‡ We met with the same trouble in a less degree a little below the confluence of the Rio de Pelechuco and Rio Amantala, and also at San Rafael on the Rio Lanza It is for this reason that fine muslin is used instead of netting in Bolivia.

decomposed into laterite rendering this possible. At the mouth of the Rio Fornada, at a height of 7300 feet, the road crosses by a bridge to the left bank and rapidly ascends, keeping near the torrent. Huts now occur at frequent intervals along the track. The climate as far as Llama-chaqui (9910 feet) is that of the colder temperate regions, and the rocks and ledges are filled with plants of familiar types. Above this altitude the country takes on a bleaker facies, and Pelechuco itself, at a height of 11,580 feet, stretches across the bottom of a sombre valley. It is a fairly large place, containing perhaps five hundred houses or small huts. It enjoys a certain commercial prosperity, being the *entrepot* for the import and export of goods to and from a great part of Caupolican. A Peruvian consul resides there, who facilitates the passage of rubber and other goods through Peru. The valley is nearly always involved in mist, which is condensed as the prevalent east wind rises on approaching the Cordillera.

From Pelechuco I made a short expedition to examine the new mule track to Pata then in process of formation. We ascended by a path cut in the hillside to a high-level valley which enters the upper slopes on the left of the main valley, about a mile below Pelechuco. It commences some 10 miles to the westward in the snow-fields of the Cordillera Real, and lateral ravines on the south side join it from other portions of the main range. The lower part was covered with grass, and afforded a certain amount of pasture for cattle. At one point were a number of primitive circular huts built of blocks of rock; those of the lowest circle were large, and nearly as high as they were broad, while above they were flatter, and placed so that each row projected inwards beyond that below, the highest circle being so small that a single flat stone was sufficient to close the opening in the centre. After following the valley upwards for about 2 miles, the road ascends the northern slopes by a series of zigzags. Looking back I recognized at some points on the southern side of the valley floor traces of moraines corresponding to several successive positions of a glacier which once extended further down on that side than on the other. At a height of 15,095 feet, the track passes over the northern margin into an amphitheatre of black shaly rocks with here and there a patch of snow, and then leads north-westward across a steep slope above a clear mountain tarn.

We now reached the main Queara valley, which runs north-east parallel to that of the Rio de Pelechuco. An abrupt descent of several hundred feet led to a kind of step occupied by a small lake.* Beyond there is a still steeper descent down to another level platform, where stands the finca or farm of Queara (11,100 feet). It is less than 500 feet

* Most of these mountain lakes appear to owe their origin to the accumulation of *débris* from the slopes. In some cases, however, especially on the south-west side of the Cordillera Real, the barrier is formed of morainic material.

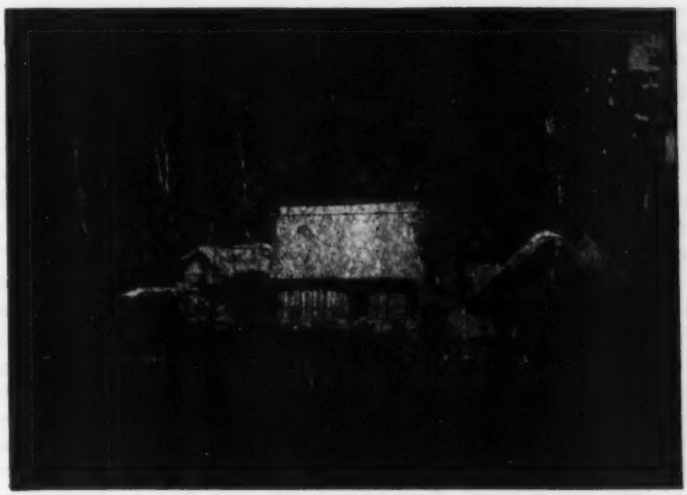
below Pelechuco; but, shut in as it is and facing the north, it has a much milder climate, and European fruit trees are said to flourish.

Below Queara the valley continues to descend by sudden drops corresponding to enormous landslides, which have filled up the narrow valley and allowed the formation of alluvial flats above. In some of these there is pasture for cattle, and maize and other sub-tropical crops are cultivated. The track now leaves the river and ascends the right-hand side of the valley till it reaches gentler slopes, which are covered with grass. Far above is the old Inca path through the mountains to Mojos. We soon arrived at the end of the track, which was still in process of formation, and then had a difficult clamber over boggy ground till the Inca path was reached. This was somewhat difficult to follow, ascending and descending nearly vertical rocky staircases, and crossing smooth dip surfaces of slate, where, however, a ledge of rocks had been somehow fixed to secure a footing. Incredible as it appears to the stranger, the Indians are able to take mules along the path. Following this ancient route, we reached the mountain shoulder of Calle.* From this point it was easy to follow with the eye the course of the river. It unites with the river Naranjani (river of oranges) to form the Rio Mojos, which, as I have already stated, enters the Tuiche opposite Pata. The lower part of its course was visible from Pata, but the spot where I now stood was then covered with clouds. From Calle I saw clearly the mountains round Pata, Santa Cruz, and Apolo, and beyond, not only the heights of Jatuncama, but a portion of the Jatunari or Bala-Susi mountains; while to the northward

* In Spanish a "street," referring, I suppose, to the Inca track, which continues down to Mojos. Thence it probably followed the present route by way of Pata to Santa Cruz del Valle Ameno. The stone causeway between those places may, to some extent, date from Inca times. Then, I believe, the old route led across the head of the Apolo valley and Jatuncama to the river Ipurama. I was told that one day's journey down the river from Ipurama, remains of the road were still visible, and palto (alligator-pear) trees growing, which had sprung from those planted by the Incas; that it continued through the forest and across the Bala-Susi mountains to the great plain, where traces of it were to be found; and that ultimately it reached the Madidi or Beni. This is confirmed by the R.P. Fr. Codinach, who told Colonel Church that an Inca road, 25 feet wide, ran past Ixiámas from the direction of Cusco towards the Beni. Long lengths were well paved and still visible, (8) p. 150. We are also told of another Inca road that led past Suri and Camata (in Muñecas) and Aten to Jatuncama, and thence by the gorge of the Siliamas (Esiliamas) to San José de Chupiamónas (or more probably one of its older sites near the Esiliamas); see (1) p. 22. Its width was "very regular;" it was paved according to locality, and had small fortifications "at the high points of the *pampa*" (see 'Memoria historica del Colegio de San José de la Paz,' by R.P. Rafael Sains (unpublished) (6), (8) p. 148. The latter portion appears to have coincided with the road first mentioned. Traces of this road may also be seen near Mamacona, between Apolo and San José, (1) p. 14. The route from Pelechuco to Pata by the Coran-huata and Amantala was opened early in the eighteenth century, because the Augustins objected to the Franciscans passing the mission at Mojos, (5) pp. 16-18.

a good view was obtained of what I believed to be the Carabaya mountains.

I left Pelechuco on May 9, and continued to ascend the valley towards the Cordillera. On the north-west were lofty cliffs, while on the south-east the slope was less. The entrance to one lateral valley on that side appeared to be occupied by the moraine of an old glacier, through the centre of which a stream had worn a passage. About 6 miles from Pelechuco the valley turns to the west, while the road climbs the southern slope into another higher valley containing two small lakes. The nearest of these belongs to the drainage of the Pelechuco valley and the Atlantic system, while the overflow from the other



SAN JUAN, FOREST POST ON THE TRACK FROM BUTURO TO R. MOSO-HUAICO OR LANZA.

ultimately reaches Lake Titicaca. The watershed is at a height of 15,375 feet.

Nearly the whole of the journey from Pelechuco was performed in a snowstorm, which became gradually more dense, till it was impossible to see more than a few yards. We passed herds of llamas and alpacas, which were being driven home to shelter, and at last reached at Cololo the small stone huts of the Indians who owned the flocks. I was told that it snowed almost every afternoon; yet, in spite of their apparently uncongenial and comfortless surroundings, the Indians are comparatively well-to-do, owning a large number of these Western camels, whose wool fetches good prices in the nearest Peruvian towns. When we moved off in the early morning it was still freezing hard, and

the snow covered everything, but the day soon brought a considerable increase of temperature, and before long the lower ground was clear. In many places glacial striation was visible in the surface of the rock. We followed the river Cacachamoca to the point where it enters Lake Cocha-quin-grai,* which stretches south-west for 5 or 6 miles. We continued our journey on the north-west bank, while the route to La Paz is on the opposite side. The south-west end of the lake is apparently a mass of moraine material, which forms an expanse of irregular hills with pools in the hollows. After passing the river Sorapatamayo, which flows from north-west to south-east from Sorapata (Altarani) towards Lake Titicaca, a low ridge was reached, which is probably also composed of glacial material. On the other side of this were more pools with a little pasture round them, on which llamas were feeding. Beyond stretched a level and nearly barren plain for 8 or 9 miles, to the low hills near Cojata. One or two streams we met with flowed towards Lake Titicaca, the most important being the river Cojata, which is on the Peruvian side of the international boundary. The latter was marked by adobe pillars at long intervals. There was no custom-house, or any restriction on the free transit of persons or goods. Cojata is a small well-to-do town chiefly engaged in the wool trade. It is at a height of 13,875 feet above the sea. The climate is severe, and snow frequently falls.

From Cojata the road passes over a series of ridges of more or less calcareous sandstones by Calingache and Giterani to Bilqui-chicu. The valleys are in many cases fertile and well watered; crops of barley and quinoa are grown, and there is pasture for numerous cattle. Leaving Bilqui-chicu, which is a small but apparently prosperous village, the road skirts the lake for some distance, and then, passing hills of dark-blue limestone which rise out of the alluvium, reaches the little town of Huancané. Thence it continues across a flat alluvial plain, through which the river Rames flows towards the lake that probably once covered the whole plain. It is passed on *balsas* formed of a kind of reed that grows in the lake. About 3 miles beyond it the town of Taraco is reached, near the foot of a low line of hills. Like the other towns and villages of the Puno, it is mainly inhabited by Indians. A large part of it consists of the crumbling walls of roofless houses, and its population must now be very much less than it once was.

Crossing several more ridges of limestone or sandstone, separated by more or less barren alluvial plains, Juliaca, the junction of the Sicuani and Puno branches of the South Peruvian railway, was at length reached. From Juliaca I returned to La Paz, whence I travelled again to Sorata, and then crossed by the Tipuani route, which I have already described, to Huanay, and once more descended the Beni as far as Rurenabaque.

* *Cocha* means "lake."

Before describing my further journey down the Beni, I propose to refer briefly to the general structure of the Andes in Northern Bolivia, and the water system of the rivers that drain them. The details of the geology of the country traversed by the expedition will be dealt with in a paper I propose to read before the Geological Society. The classical work of Alcide D'Orbigny * and David Forbes † has already made us acquainted with the main features of the geology of the highland plateau (altaplanicies) and the country between it and the Pacific, as well as that of a large portion of Eastern Bolivia.

The western coast of South America has a south-eastern trend from Cape Pariña in lat. 4° S. to Tacna in lat. 18° S., and the direction of the different ranges of the Andes is approximately the same between those latitudes. The western or rather south-western Andes appear to consist mainly of strata of secondary and later age, with interstratified and intrusive igneous rocks, while on the plateau or altaplanicies between them and the Cordillera Real we meet with ridges of rocks of devonian, carboniferous and permian or triassic age rising out of alluvial deposits derived from the erosion of the adjacent hills and mountains.

The Cordillera Real enters Bolivia near Pelechuco, and runs south-east to Illimani. As far as the margin of the Tipuani valley it appears to consist mainly of slates and intercalated arenaceous beds forming an involved anticlinal, which probably includes rocks of every age from cambrian, or at any rate ordovician, to lower devonian. Granite intrusions are said to occur at some points in the Province of Muñecas. Further to the south-east a core of granitic rocks has been introduced into the centre of the synclinal. It is this that by its greater power of resisting eroding agents has given rise to the magnificent succession of lofty peaks from Ancohuma to Illimani. To the north-east long spurs stretch out from the main axis, but no definite range is met with till the important chain is reached which I have called the Cusali mountains. These form a line parallel to the Cordillera Real at a distance of 55 miles from it. North-westwards they appear to be prolonged into the lofty hills on the south-west side of the Apolo valley, the highest of which is known as the Cerro de Santa Cruz, while south-eastward they form a wall on the north-eastern side of the valleys of the Coroico and Yara. It seems probable that still further in the same direction the same range is traversed by the Rio de la Paz, and that it then forms the watershed between the upper valley of that river and that of the Rio de Cochabamba. So far as my observations extend, these mountains are composed of slates, sandstones, and limestones of palæozoic age.

Another less-defined line of hills is passed on the Rio Caca at

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* 'Voyage dans l'Amérique Méridionale,' vol. iii. parts iii. and iv. (1842).

† "On the Geology of Bolivia and Southern Peru," *Q.J.G.S.*, vol. xvii. p. 7 (1861).

Chiniri, and may correspond to the hills north-east of the Apolo valley. The Beu and Chepite ridges traversed by the Beni near the streams of the same names are also well-marked features in the topography of the district. The former may be represented further to the north-west by the Giteranipata and Chiru-Choricha mountains, and the latter by the Ucumari and Jatunari ridge. The hilly region between the Tuiche and Esiliamas appears to be unrepresented by any high land in the neighbourhood of the Beni. Finally, the Bala-Susi mountains also consist of two ridges, the outer or Susi range being comparatively local. These mountains are the last of the foothills of the Andes, and constitute the boundary of the great Amazonian plain from a point south-east of Rurenabaque north-westward for more than a hundred miles.

All the country from Pata to the Bala-Susi range near Buturo is high above the sea, except for the narrow valleys of the Tuiche and some of its tributaries, but between Huanay and Rurenabaque the intervals between the ridges are mainly occupied by broad expanses of alluvium and low hills of sandstone and conglomerate of comparatively recent formation. Still further to the south-east the Beu, Chepite, and Bala-Susi mountains die out, and the lowlands that flank them merge in the great central alluvial plain of South America.

It will be noticed that all the parallel ranges from the Cordillera Real to the Bala-Susi mountains are traversed by rivers flowing from south-west to north-east. There are cogent reasons for believing that the course of these streams dates from a remote period—before the evolution of the present features of the country, in the course of which the ridges and valleys have been formed by differential earth-movements and the operation of subaërial agents of erosion, and the depressions filled in with an enormous amount of detrital material of various ages, some of which appears to have been afterwards subjected to considerable earth-movements and erosive action.

As the lines of hills rose and the longitudinal valleys were formed by erosion and the same folding that elevated the ridges, the rivers cut deeper channels through the barriers which threatened to exclude them from the South American plain. This destructive action of rivers, which is nowhere so effectual as in mountain regions where the velocity of the current is great and its transporting powers are immensely increased, is sufficient to account for even the deep valleys that traverse the Cordillera Real itself, though it is possible that lines of weakness, local synclinals, or the occurrence of softer materials may have determined the locality of the main avenues by which the waters flow eastward.

It is probable that for a long period the surplus water of the alta-planicies passed out through the gaps in the Eastern Cordillera, and though at present a large area belongs to the inland system of Lakes Titicaca and Poopo, yet most of the rainfall from the north-eastern slopes, where

the precipitation is heaviest, still passes to the north-east into the basin of the Amazon, and not a single stream flows out south-westward through the Western Cordillera. A similar state of things is met with throughout the portion of the Andes where the winds generally blow from the east. While heavy rains fall on the eastern Andes, the western ranges and slopes have always been comparatively rainless, and the streams that flowed into the Pacific have been unable to deepen their channels sufficiently rapidly to keep pace with elevation occurring along an axis intersecting their courses.

In Patagonia, where western winds prevail, the higher ranges are

PELECHUCO FROM NORTH-EAST, CORDILLERA IN DISTANCE.

repeatedly traversed from east to west by deep river valleys, there having been sufficient rain during the elevation of the mountains to keep open the courses of rivers flowing to the westward.

In Northern Bolivia, the first foldings must have taken place in very early times; but at the beginning of the carboniferous period there is reason to believe that the sea stretched across the line of the present Cordillera Real. Before the close of that period elevation must have brought to the surface and exposed to denudation a considerable amount of land in the immediate neighbourhood, probably a longitudinal strip near the south-western border of the present altaplanicies. About the end of the palæozoic the land would seem to have extended

further to the north-east over the site of the Cordillera Real, while rivers probably flowed out both to the south-west and north-east. As the folding proceeded the land on the north-east gradually rose and formed hills, but the streams still kept open their way through on that side. Even when mountains were formed large enough to rob the trade winds of most of their moisture, much of the precipitation must have occurred then, as it does now, on the western slopes of the range, and fed the rivers flowing through the gorges. At that time the state of things would have been very similar to what we now find in Patagonia, but with east and west reversed. There the watershed between the Atlantic and Pacific is usually found at a moderate altitude, yet the streams that flow westward from it pass through the lofty Cordillera to the sea. The rise of the Western Cordillera in Peru and Bolivia seems to have occurred at the close of the mesozoic period, and to have continued till modern times. An epoch of complete rainlessness at any time during this period of elevation would be sufficient permanently to bar the outlet to the south-west of streams from the plateau between the two ranges.

The history of the hydrography of the inland basin is at present obscure. There is every reason to suppose that it is a depression that owes its origin mainly to a differential change of level, and only to a less degree to the erosive action of water. At first the whole drainage would pass out eastward by deep valleys traversing the Cordillera—such as the Sorata-Mapiri gorge, the Rio de La Paz gorge, and the valley of the Pilcomayo—to the Amazonian or La Plata basins. Subsequently, during a period when the rainfall on the altaplanicies was almost entirely confined to the strip immediately to the west of the Eastern Cordillera, longitudinal folding must have occurred, which caused the formation of longitudinal synclinal valleys, separated by higher ground. In this way the comparatively rainless region of the central and south-western part of the plateau was cut off from the north-eastern portion and from the Atlantic. It is true that the gorge of the Sorata and La Paz rivers is lower than any part of the Titicaca-Poopo basin, but there is now a ridge between the Sorata and Illabaya valleys on the one hand and Lake Titicaca on the other, which is nowhere less than 1500 feet above the lake, while there is every reason to believe that a similar ridge, covered in places by fragmental deposits, divides the La Paz valley from that of the Rio Desaguadero that connects Lake Titicaca to Lake Poopo. The valley of the Pilcomayo is separated from the inland basin by a rocky ridge that rises at its lowest point over 2000 feet above the latter.

The enormous deposits of alluvium in which, as we have seen, the La Paz cañon is now being eroded, appear to represent, not the alluvium of a lake, as is generally supposed, but the infillings of a longitudinal valley of depression formed close to the Cordillera Real.

When the gorge of the Rio de La Paz through the mountains had not been worn down to its present level, the torrents from the mountains brought down, as they do still, continuous supplies of sand, gravel, and boulders, which were spread out and accumulated on the valley bottom, as the slope of the effluent stream did not give it sufficient force to remove them. Now that the outlet has been worn deeper, and the inclination is consequently greater, the river is working back on all sides amongst the loose accumulations of the past.

Against solid rock which has not been lateritized or otherwise weakened by the action of underground water, the rate of cutting back is apparently very much slower. I made a careful examination of the head of the Illabaya valley near the Huallata pass. There seemed, notwithstanding the much greater declivity on the north-eastern side, to be no appearance at the watershed that progress was being made towards the south-west. In any case the advance must be very slow. I cannot believe that the operation of cutting back has appreciably affected the main features of the hydrography at this point.

The ranges to the north-east of the Cordillera Real appear to be the result of foldings of more recent date. They may be considered as successive crumples of the margin of the Amazonian plain.*

A few words must be said on the subject of laterization. Though it belongs mainly to the provinces of mineralogy and chemistry, yet it has such far-reaching effects on the surface features, the soil, and the character of the roads in most tropical countries, that it cannot well be passed over in silence in a paper dealing with the geographical features of such a region. Its operation is confined to rocks containing silica and alumina, as well as, in most cases, oxide of iron, lime, and other substances. In the process, much of the silica and lime is removed, and what is known as laterite is left. This is of varying degrees of hardness, according to the amount of iron and moisture present. In damp countries it is usually a slippery adhesive clay, which adds considerably to the labour of the draught animals in the valleys, and on steep slopes is sometimes a serious element of danger, as in places on the old road from San José de Chupiamónas to Apolo. In drier climates, or if a larger amount of iron is present, it may be as hard as brick, whence the name it has received. Laterite is never found to any extent at the present time except in the tropics, and not there at very high

* The river phenomena in the Apolo valley indicate the probability that relative changes of level have occurred in comparatively recent times. The ancient wide and nearly flat-bottomed valley appears to have been formed at a time when the district stood at a lower altitude, and the fall and erosive power of the waters were less than at present, when the streams are cutting deep ravines in the floor of the old channel. The increased slope might be explained by the wearing down of a barrier at a lower level in the course of the river Aten or river Caca, but I am disposed to think that an elevation of the area round Apolo furnishes the true explanation.

altitudes, though in India it occurs up to the summit of the Nilgiris at a height of nearly 8000 feet. In the region I have been describing, it reaches a height of 7000 feet, but the unaltered rock is everywhere found in or near the beds of rivers, where the water would wash away any of the material decomposed, or perhaps hinder the progress of the decomposition.*

After returning from a visit to Reyes, I finally left Rurenabâque on June 26, in the batelone which carried the mails. It had ten Indian rowers, and an assorted cargo of European goods and products of the country for sale at the rubber stations on the river, and was to bring back rubber. We descended the rapids of Altamarani formed by the gravel deposited by the river on leaving the mountains, and having completed our cargo, continued our journey, passing on the right bank Puerto Salinas, called after an Indian, Pedro Salinas, who made a track from Reyes to this point, and then on to Tumupasa. Below Santa Teresa, which is only nine hours' journey from Tumupasa, there are no inhabitants till the neighbourhood of the mouth of the Madidi is reached. After passing the Inaderi (Enadere), we lost sight of the Bala-Susi mountains in the mist, but when the air is clear they must be visible for a much longer distance.

On July 6, we reached the Peña de Guarayos (Rock of the Guarayos or Guacanaguas, who once had settlements in the neighbourhood). Below the mouth of the Madidi † Rubber barracas were frequently met with, and as a general rule we stopped the night at one of them. We had previously slept in the forest or on a broad sandy beach.

At Etea is the headquarters of the Intendente of the Beni. It is at the foot of a hill of lateritic material 70 or 80 feet above the river, the highest elevation I saw between Rurenabaque and the cataracts.

The next barraca is San Lorenzo, whence a track runs to the Manutata (Madre de Dios), which can be reached in two or three days. There is also a track for cattle and mules down the right bank of the Beni from Reyes to the rubber barracas, but it is very swampy and practically impassable in the wet weather. From Peña Vermeja, which we passed on the 13th, a track leads to Santa Anna on the Rio Mamoré, which can be reached in fifteen days. From the next barraca, Exaltacion, a track, crossing the Manutata at Genichiquia (6 leagues), the Orton at

* It is evident that the process depends to some extent on the temperature; but Mr. T. H. Holland, the Director of the Geological Survey of India, who has reviewed the whole subject in the *Geological Magazine*, 1903, p. 59, points out that it does not appear to be operative in temperate regions and on slopes of the Himalayas that have a *mean* annual temperature equal to or higher than that of localities in the tropics 7000 or 8000 feet high where laterization occurs, but a much lower *minimum* temperature. He suggests that the phenomenon is the result of the action of a germ that cannot live where the winters are severe.

† The "black ant," also known as the Nagigi and Masisi, (10) Sp. tr. note, p. 7; (3) p. 38.

Palestina (20 leagues), and the Abuná at Santa Rosa (36 leagues), leads to the barraca of Capibara on the Acre (52 leagues).

From the Rio Genesuaya to Riveralta * there are few rubber properties on which the industry is carried on to any considerable extent, as they have been exhausted and will require some years to recuperate, but sugar-cane and tobacco are extensively cultivated. After passing the confluence with the Manutata and the island of Antenor, we arrived at Riveralta on July 16, having been greatly delayed by the time spent in peddling the cargo of the batelone at the different barracas at which we stopped.

There is little business transacted at Riveralta since the fall in the price of rubber in Europe, and the cessation of the period of speculation and inflation that prevailed up to about the end of 1900. It stands, as its name implies, on a high bank, and is cool, healthy, and almost entirely free from mosquitoes and sandflies.

From Riveralta I ascended the Manutata † in a steam-launch to Conquista, a station on high ground at a little distance from the river. Here there was formerly a large settlement of the Indians. I afterwards had a conversation with Señor Bernardo Pando, who lived among them for a year in 1884. They were like many of the wild Indians in this region, divided into two clans, the Araonas and Cabinias, marriage being only allowed between members of different clans. Almost the whole tribe was blotted out a year later by an epidemic of dysentery. The Indians now living at Conquista have come from the river Tahuamanu, one of the affluents of the Orton.

From Conquista I travelled about the forest, and had an opportunity of observing the life of the Indians, many of them *barbaros*, engaged in collecting rubber. As is the case everywhere in the lowlands of Bolivia, the Indians live in a kind of voluntary slavery. An account is kept with each man showing the salary earned, usually from fifteen to twenty bolivians a month, and the amounts owing for goods supplied, exclusive of the necessaries of life. The price of these goods is usually rather higher than the cash value, and the total owing is allowed to mount up till it approximates to the capital value of the labourer—about two years' pay. He is now bound till he can pay this off. Flogging is occasionally administered, as many as two hundred lashes being given. As long as they are employed in the healthy districts, the Indians do not seem, as a rule, to have much to complain of; but large numbers die of fever in the region of the cataracts of the lower Beni and Mamoré and of the Madeira, as well as in the river Abuná and lower Aquiri (Acre).

* The lower Beni was first opened out by Dr. Heath in 1880, (10) pp. 128, 132.

† The upper course of the Manutata was long known to the Peruvians and the Franciscan missionaries. Its connection with the Beni was demonstrated by the ill-fated expedition of Maldonado in 1861. It was ascended in 1884 by R. P. Fr. Armentia to the mountains, (1) pp. 31, 87.

Many of the Indians are brought from the upper Mamoré and the neighbourhood of Santa Cruz de la Sierra or the Chiquitos. Others are kidnapped as children, either in the regions just mentioned or from savage tribes on the Manutata, or Orton, or their tributaries. Sometimes an Indian village is surrounded and all the children removed. It is this that is the chief cause of the trouble with the wild Indians. Many households have a kidnapped child, who is treated as a pet till he or she is old enough to work. The Bolivian Government is doing all it can to prevent the ill-treatment of Indians.

Travelling overland, we reached the Orton * at the barraca Peninsula, whence we ascended to Trinidad de Clames, the barraca of Señor Pando. We then descended the river in canoes past Palestina and Mercedes, from which points there are tracks across the Abuná to the Acre, to the confluence of the Orton with the Beni, and ascended the latter river to Riveralta.

I finally left Riveralta on July 11, and passing Florida, from which a track leads to the cataract of Guayamerim on the Mamoré, arrived at the cataract of Esperanza on the 13th. Two or three miles above Esperanza, there is a slight rapid, where a line of rocks is passed, running west-north-west and east-south-east. The cataract of Esperanza is much more serious, and completely blocks navigation, so that batelones have to be taken past it over the rocks. These are of coarse gneiss, and have the same direction as the rocks above, which are, no doubt, of a similar character. They are the first solid rocks met with after leaving Rurenabaque, though in many places hard ferruginous material deposited from the river occurs among the alluvial beds.

There are a large number of buildings at Esperanza, and a tramway has been constructed round the portion of the cataract which cannot be passed by batelones. The neighbourhood is malarious, as is the case with all the cataracts.

Continuing down the river, a brief voyage of three or four hours brought us to Villa Bella, situated at the junction of the Mamoré and Beni, just above the cataract of Madeira. I ascended the Mamoré for a short distance in a canoe, and found gneissic rocks similar to those at Esperanza.

On the 22nd I crossed to the Brazilian side of the river, which is inhabited entirely by Bolivians, except for a minor Brazilian official, a negro, and two soldiers from Santo Antonio, whose huts have received the title of Villa Mortinha. Little seemed known about the interior;

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* Its chief affluent is the Tahuamanu, which receives the Buimanu and Manuripi on the right bank. The sources of all these streams is in hilly country with rocks. The name Tahuamanu was originally applied to the whole river, but the term Orton is now used for the portion between the confluence of the Manuripi (small river) and the mouth. Señor Ballivián says it is also called the Datimanu (river of turtles), (10) Sp. tr. note, p. 30. The nomenclature of Fr. Armentia is somewhat different, (1) 35.

but one of the small streams had been ascended for three or four days' journey, in spite of the malarious character of the region. There were *barbaros*, who, however, were not dangerous; hilly country was met with, but nothing was known about its extent.

I left early on the 23rd for Santo Antonio, in a *monteria*, a canoe from 12 to 14 feet long, with six rowers. It was fairly light, and easily transported over the rocks, and there was no cargo beyond my own effects, so there was little delay at the cataracts, and I reached Santo Antonio on the 29th.

I left Santo Antonio on September 10 in the steamer *Paes de Carvalho*. It arrived late on its journey up from Manaos, having been greatly delayed by the low state of the river, in spite of the fact that it was one of the smallest passenger steamers that navigate the Rio Madeira. The river was still lower when we descended; so that we could not travel by night, and occasionally suffered considerable delays from the difficulty of finding a practicable channel. We reached Manaos on September 24, and I left three days later by a steamer of the Booth line for Liverpool, where I arrived on October 18.

Climate.

The seasons are not so well marked as in other tropical countries I have visited. There is no real dry season such as is experienced in India and South-West Brazil, and the distribution of the rainfall varies considerably from year to year, and from point to point. I crossed the Cordillera Real early in September in a slight snow-storm. It rained the greater part of the succeeding day on the upper part of the north-eastern slopes of the Cordillera. During the rest of the month rain only fell on one day, but on many occasions the sky was threatening, and rain must have fallen on the adjoining heights. In October, which was mainly spent in the valley of the Rio Caca, rain frequently fell, the total amounting to about 9·2 inches, falling on sixteen different days. In November at San Buena Ventura, just beyond the outside limit of the mountains, the total rainfall was 13·5 inches distributed over eleven days. In December it rained eight or nine days, on several occasions very heavily. The total for the month was probably about the same as for November. In January, in the Tuiche valley, it rained on eleven or twelve days, on five occasions heavily. In February, on the way to Apolo and at that place, it rained on ten or eleven days, often very heavily. In March, 6 inches fell—in fifteen days—at Apolo. In April, at Apolo and on the road to Pelechuco, it rained on ten or eleven days, about 5 inches falling. In the first ten days of May it rained or snowed, near Pelechuco and on the road to Juliaca, on three or four days. In June, on the way from Sorata to the Beni, it rained on seven or eight days. In the low country, in July, August, and September, occasional heavy showers occurred.

It will thus be seen that no month is completely free from rain, and that from October to April there is a heavy, but never continuous fall. The actual amount, however, varies as we have seen, from valley to valley and in different parts of the same valley, and diminishes, though in an irregular manner, as we pass from the Cordillera to the plains. Several days of rain may occur on the south-west side of the Bala-Susi range, while it is quite dry in the plains.

To the north-east of the Cordillera the prevalent winds are south-east and north-west. The frequency of the latter wind appears to become greater as the distance from the Cordillera increases. Everywhere to the north-east of the Cordillera the south-east winds brings cold, cloudy, and usually rainy weather. It is generally preceded by a period of low atmospheric pressure, but its arrival is accompanied, or even heralded, by a sharp rise in the barometer. In the plains this wind is known as the "Sur" or "Surazo." It often sets in with great violence, and the rain is sometimes followed by a period of cold dry weather. In Caupolican, when winds are light, they often blow from the south-east in the morning, and north-west in the evening. When the days are overcast, the sky sometimes clears for a short time soon after sunset, but soon clouds over again.

There is a general correspondence between the movements of the barometer at La Paz and in the plains, that is, a wave of high or low pressure affects both, but the resulting weather is widely different.

The temperature throughout the region I have been describing is lower than might have been expected from the latitude and altitude. The opposite table gives the chief particulars of the temperature and humidity of the different localities where any considerable stay was made.

In June, 1902, Mr. Turle and Mr. Williams travelled from Sorata to Aten by way of Cruz-pata, Tacacoma, and Colabamba, crossing the river Mapiri near Incachaca. From Aten they continued their journey to Apolo. They then travelled east-south-east, and ultimately north-east across the Chiru-Choricha range, which appears to be a south-eastern extension of the Giteranipata Mountains, and came within sight of the Jatunari range. The valley between drains to the south-east into the Tuiche. They returned across the Turiapo to Aten, and subsequently explored the country to the south-east of that place. Later on, they spent some time in examining the region south-west of Apolo, and south-east of Santa Cruz del Valle Ameno, and then returned to La Paz by way of Aten, Mapiri, and Sorata.

I have to record my acknowledgments to Mr. Turle for his assistance, and for his notes on the journeys last mentioned. Mr. Williams worked indefatigably at his collection of plants, which is, I believe, unrivalled by any other from the eastern slopes of the Andes.* Mr.

* The species collected exceed 2000 in number, of which 800 are cryptogams, and at least 160 new to science. Four complete sets were taken, and a large proportion of

	Daily Temperatures.						Average humidity.
	Maximum.			Minimum.			
	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Pressure of water-vapour.
Mapiri, Sept. 18–21, 1901	90·0	92·0	87·5	70·0	71·0	69·0	0·678
Mayaya, Oct. 3–6, 1901	92·2	95·0	88·5	72·2	76·0	66·0	0·813
Maquique, Oct. 6–29, 1901	89·8	95·5	77·5	71·4	73·5	68·5	0·832
San Buena Ventura, Nov. 1 to Dec. 3, 1901	87·1	95·5	72·4	72·5	76·8	64·0	0·838
Tumupasa, Dec. 8–22, 1901 ...	87·5	92·5	80·0	71·6	76·6	68·5	0·758
Tumupasa, Jan. 3–29, 1902 ...	82·5	87·0	70·0	71·3	74·0	63·2	0·766
Apolo, Feb. 20–28, 1902	77·7	82·0	69·0	65·2	68·0	63·0	0·583
Apolo, Mar. 1–13, 1902	75·9	83·0	70·1	64·5	74·4	62·6	0·608
Apolo, Mar. 14–31, 1902	77·7	86·2	68·5	63·5	68·8	59·5	0·605
Apolo, April 1–18, 1902	81·6	92·8	69·2	65·1	67·7	58·1	0·607

Watney had charge of the cartography of the expedition; the map that accompanies this paper is mainly his work, though Mr. Turle and I contributed topographical data regarding regions which Mr. Watney did not have an opportunity of surveying, and I am responsible for many of the orographic details. I can speak for the care and accuracy with which his astronomical observation were taken. The survey was carried out under exceptional difficulties. Almost all the hills were clothed with thick forest. This not only rendered access very difficult, but even when the summit was reached, the height and density of the trees made both astronomical and terrestrial observations impossible without the expenditure of an immense amount of labour in felling trees. Astronomical work was also interfered with by the frequency of cloudy weather, and the hazy state of the sky at low altitudes. The half chronometers were necessarily much affected by the rough methods of travelling, and the moist atmosphere, and consequently too much reliance must not be placed upon the longitudes. Repeated efforts were made to check the determination of longitude by observations of occultations, but, unfortunately, in no case did the state of the sky permit it.*

the species are represented by specimens from different localities, so that the total number of specimens obtained amounts to many thousands.

* The positions of the following places, as shown on the map, were determined by astronomical observations: Charopampa, Isapuri, Mayaya, camp near Maquique, Mariara, camp on Beni below river Suapi, camp on Beni near Bala, San Buena Ventura, Tumupasa, Ixiámas, San José de Chupiamónas, Apolo, Aten, Asilla, Buturo,

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I propose to deal with the subject of the hydrographical system of the Andes in a short paper before the Research Department of the Society. In the mean time I would only express my conviction that the phenomena referred to by Sir Thomas Holdich tend to support rather than contradict the views I have put forward.

Before the reading of the paper, the CHAIRMAN (Colonel G. E. CHURCH, Vice-President) said: It is a great pleasure to welcome here this evening Señor Aramayo, the Bolivian minister, and also Admiral Capello, Captain Vasconcellos and Senhor Ferreira do Amiral. Admiral Capello is a distinguished African explorer, while Senhor Ferreira do Amiral is President, and Captain Vasconcellos is Secretary, of the Lisbon Geographical Society. We have also Dr. Park Thompson, very well known as being past President and present Secretary of the Geographical Society of Queensland, a society which is doing splendid work in that far-off colony. Dr. Thomson quite recently received one of the Society's awards for his services

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San Juan, San Martin, San Rafael, Pelechuco, Juliaca. The longitude of Apolo was adjusted by a bearing on Illampu. I am inclined to think that the true position of Pelechuco is a little to the west of that shown, but there are not sufficient data to determine what correction should be made. Sir Martin Conway's map (9), which was found to be very reliable, was mainly followed for the portion within its limits. The portion of the Cordillera between the Rio Llica and Cololo and north-east of the latter place has never been surveyed, and has been only conjecturally inserted.

to geography. The paper this evening will be upon an extremely interesting portion of South America, perhaps the most fascinating of all, a district which was coveted by the Incas of Peru. The second Inca sent an expedition into the Caravaya district; the fourth Inca conquered Llaricasa just at the south of it; and the great Inca Yupanqui sent an army down the Mayutata river and conquered and pacified the whole of Caupolican, which district will be enlarged upon in detail by our friend Dr. Evans, whom I will now call upon to read his paper.

After the reading of the paper:—

The CHAIRMAN: We are favoured this evening with the presence of his Excellency Señor Aramayo, the Minister from Bolivia, and we shall be very pleased if he will make a few remarks.

Señor ARAMAYO: Although I am not prepared to take part in the debate on such an interesting paper as has been read this evening by Dr. Evans, I avail myself with pleasure of the opportunity so kindly offered me by the President in order to thank Dr. Evans, in my own name and in the name of my countrymen, for the great service which he has done to my country by the very interesting investigation which he has made of one of the most important districts of the republic which I have the honour to represent, and to congratulate him upon the success of his travels and for the excellent description which he has given us this evening of his explorations. Without considering myself biased in any way by an excessive patriotism, I think the region which has been examined by Dr. Evans, namely, the northern part of Bolivia, is one of the most interesting countries in existence, and most worthy of being thoroughly investigated in a scientific way, either geologically or geographically, as being endowed with the greatest variety of valuable productions, and having, as Dr. Evans has pointed out, a great variety of climate, besides being of comparatively easy access, and partly crossed by a great number of navigable rivers which flow into the Amazon. In fact, I believe it is only a matter of opening up the country by means of navigation and roads in order to make it one of the most enviable spots on the face of the Earth. I have pleasure in stating here this evening that the present administration of Bolivia has made strenuous efforts to explore all those regions which have been up to the present very little explored, and to encourage the explorations made by scientific societies. We have not been equally successful in our attempts to open out the country to the commerce of the world, on account of lack of financial support, and we have lately failed in an important attempt to open up the rubber districts of Beni and Acre on account of a certain amount of jealousy displayed beyond our frontier; but I feel confident that in the course of very little time, some years perhaps, we shall be able to open to the commerce of the world a most valuable region, capable of being the happy and prosperous home of many millions of settlers. I think it is worth mentioning, and certainly a very happy augury, that the King should have thought it convenient to appoint a minister resident at La Paz, a step which, I think, will tend to establish greater increase of friendly relationships between the two countries, and I believe to the benefit of both. I hope that the steps of Dr. Evans may be closely followed by other explorers, and I have only to say that they will be considered as the most welcome guests, and they will be given every possible facility to advance the work of civilization and progress which is the aim of this Society.

Sir MARTIN CONWAY: I have listened with very great pleasure and interest to the lucid account which Dr. Evans has given us, though necessarily so briefly, of his very interesting journey. Naturally it has interested me very much, because the region that he has travelled through and explored is adjacent to the region which I travelled in a few years ago, and his survey joins on to mine. I confess

that I listened with some envy to his descriptions, and looked at his photographs likewise with envy, because the region through which he travelled, though not quite so magnificent as the central region of the mountains, has a far greater luxury, and far more of what we understand in the ordinary way as beauty. I have only looked down upon the fringe of this region, but I saw enough to know that here is a country of very singular and extraordinary beauty. You have a diversified land whose tangle of mountain ranges Dr. Evans has resolved into a series of essentially parallel ridges, parts of the same crinkles of the Earth as the Andes. You have those foothills with great magnificent forests, and you have valleys in between them rich in the soil which they carry and wonderfully rich in the vegetation which they produce, and you have a climate of extraordinary suitability for all purposes of agriculture of different kinds. The result is that you have there a region that is wonderfully suitable to human habitation, and that up to the present is, as we have learnt, practically uninhabited. It was through that region I desired to travel, and being unable to do so, it is with immense interest that I listened to Dr. Evans's account of what he saw there. It would not be becoming on my part to speak at great length about a country I have not seen, but I think I am justified in adding my word of thanks to Dr. Evans, not merely for the journey that he so well performed, but for the delightful description of it which he has given us to-night. I should like to add that he was accompanied, amongst others, by an American botanist, Mr. Williams, who made a very large collection of plants. I have seen the collection. I saw it in New York about two months ago, and it was described to me by the best living American botanist as probably the finest collection, or one of the finest collections, of plants that had ever been brought out of South America by a single traveller on a single journey. At all events, he has discovered approximately 250 new species, and has brought home 2000 specimens of different plants, and of each at least four different specimens. I hope to present in his name ultimately, both to the British Museum and to the Herbarium at Kew, a complete series of the collection made by him on this journey. The third collection will be deposited in the Herbarium of the New York Botanical Museum. Well, that is all I have to say, and I am very thankful to have had the opportunity of contributing my word of thanks to Dr. Evans and his companions.

The CHAIRMAN: We have also with us this evening our friend Sir Thomas Holdich, fresh from his triumph as a peacemaker between Chili and the Argentine Republic, and we shall be pleased to hear a few words from him.

Sir THOMAS HOLDICH: I regret very much that I could not follow Dr. Evans in his very interesting journey through Bolivia, and therefore I came here to listen to him and to learn something about that country, for I have never had the opportunity of making any practical acquaintance with it. But when Dr. Evans refers to Patagonia, I find myself a little more at home, and I regret that the only criticism I can offer on Dr. Evans's interesting remarks is one of some slight disagreement with his theory as to the formation and cause of the direction of Patagonian rivers. It is true, no doubt, as he says, that for billions of years the wind currents have been much the same across the Pacific from the north-west and the west, and precipitation has been very considerably greater on the west of the Patagonian Andes than it has on the east. But for all these billions of years, till within very recent periods, the rivers have not maintained the same direction. It is very evident to a casual observer that the rivers have changed their courses, and that rivers which flow into the Pacific used to flow into the Atlantic; and I think we must look to some other cause than wind currents for the present conformation of the rivers of Patagonia. I think that probably the

alteration of their direction is much more due to the great process of desiccation which has been going on all through the world than to any action due to winds and air. This process is common everywhere. The glaciers are receding, and as they recede lakes are formed; lakes are drying up and moraines are formed, and the gradual alteration of the level of the highlands which border the foot of the Andes has been altering the direction of the rivers. There are one or two places even now in Patagonia of which it is difficult to say in which direction they drain —the Atlantic or the Pacific. That is all I can add to the interest of to-night's discussion. I have listened with very great pleasure to Dr. Evans, and wish to add my quota of thanks for what I have heard.

The CHAIRMAN: I am going to crave your indulgence for a moment by calling upon Dr. Thomson, who is the founder and head of the Queensland Geographical Society, which has done such admirable work in the southern hemisphere. Perhaps he will favour us with a few remarks on this occasion.

Dr. PARK THOMPSON: My object in offering a few remarks is not to discuss the very excellent paper with which we have been favoured this evening by Dr. Evans, but it is more on behalf of the society which I have the honour of representing, and of offering to you, sir, and the Fellows of this great British Society my very grateful thanks for the privilege conceded to me this evening in being present to listen to this very excellent paper. It has given me the greatest possible pleasure indeed to listen to Dr. Evans's remarks, and to follow him in his wanderings in that part of the country of which he has given us a very admirable description, illustrated as the description has been by very excellent photographs and the beautiful map which has been prepared by the Geographical Society. I beg, sir, without saying more, to thank you very gratefully on behalf of the society which I have the honour of representing, for the privilege of being here this evening and listening to this very excellent paper.

The CHAIRMAN: Perhaps I may be permitted also to say a word on this paper. The great province of Caupolican, known historically as Apolobamba, extends from the two Bolivian departments of Muñecis and Larecaja indefinitely towards the north. Geographers, both of Bolivia and Peru, have disagreed as to its limits. Many of the ancient geographers fix the northern boundary of Caupolican at about 7° 40′ S. lat., in accordance with the line of demarcation, from east to west, under the Treaty of San Ildefonso between Spain and Portugal. By the treaty of 1867 between Brazil and Bolivia, the boundary was changed to a line starting from the junction of the Madeira and Beni, at 10° 20′ S. lat., to the sources of the Yavari affluent of the Amazon; but the Brazilians now pretend that the limit between the two countries should be the parallel of 10° 20′ S. lat. In the varying changes of the twelve audiences of America made by the Spanish Government they shuffled the cards so with reference to departments and ecclesiastical areas that it is a very difficult problem to decide to whom belong certain territories, and I think it is more a question of occupation, perhaps, than it is of old boundary-lines; and thus Bolivia is probably more entitled than any other country to that region lying between the last two boundaries I have named. It certainly has shown great energy in developing that country, and in sending its sons from all parts of Bolivia to work the rubber deposits and make them valuable to commerce. It has laboured under great difficulties, because Bolivia is a Mediterranean country. It has no sea-coast to-day on the Pacific side; it is very difficult of access by the head-waters of the Purus river, and still more difficult by the Madeira, owing to the long line of nineteen cataracts, which interrupt navigation except by canoes, which means the hauling of them for days round some of the most formidable falls; but at the same time the country above these, according to my observation—and

I have travelled there a great deal—is perhaps the most beautiful of all South America. It has the noblest products, and the richest goldfields; I may say that in Caupolican and Caravaya and all that eastern slope of the interior range of Andes which lies to the east of Lake Titicaca, there is no country so rich in gold, and it is the region from which the Incas derived those treasures with which Atahualpa undertook to ransom from Pizarro the Inca Empire. The district from Santa Cruz, which is the eastern expression of the Andes, to the headwaters of the Mayu-tata, is one vast goldfield, but inaccessible for practical work to-day. But if its mineral wealth is so great, its agricultural resources are perhaps unequalled. It produces the best coffee in the world. There is nothing to equal the Yungas coffee. I may, perhaps, tell you that there is one little spot some distance north of La Paz, only an acre in extent, which was the burial-ground for a small Franciscan convent which still exists there. I believe that the monks have been dispersed, but the cemetery remains. There they grow the richest coffee in all Bolivia, so highly flavoured, that the two or three remaining monks send a distance of hundreds of miles, by native runners, presents of little boxes of this coffee of three or four pounds in weight. I once had this region described to me by an old man of the name of Holbrook, who walked all the way from Apolobamba, about 200 or 300 miles, to see me at La Paz and give me a description of the country. His evidence was that there was nothing obnoxious to be found there. In fact, in his most illiterate way he wrote down that "there were no venomous insects except tigers." But between the Andean tableland and the Yungas of Bolivia, there is, perhaps, the most beautiful range of snow-peaks in all the world. Sir Martin Conway will bear me out that it would be difficult to match that line of peaks which stretches over 180 miles between Illimani and Sorata. If you stand upon the Titicaca tableland and look eastward as the sun rises, there is nothing more glorious than to watch the sun as it breaks through those giants of the Andes. It is on the eastern slope of these mountains that we find Caupolican, which has been described to-night. It is a perfect paradise, but it is almost as inaccessible as the Paradise which we all seek. It now remains for me to extend to Dr. Evans your thanks for the admirable lecture which he has given us this evening.

FOUR YEARS' ARCTIC EXPLORATION, 1898-1902.*

By Commander R. E. PEARY, U.S.N.

IT is a difficult thing to compress within the limits of an hour's talk the story of four years of almost continuous Arctic effort, but I shall try to fix in your minds an outline, at least, of the work of my last Arctic expedition. My original plan; the inception and formation of the Peary Arctic Club, which financed the work; my preliminary expedition of 1897, which secured and brought home the "Ahnighito," largest of known meteorites; Mr. Harmsworth's gift to me of the

* Read at the Royal Geographical Society, November 10, 1903. Map, p. 724. We have to acknowledge the courtesy of the Peary Arctic Club in sending a copy of their report on the expedition; the main facts are embodied in Commander Peary's paper.

Windward; and my departure for the north in July, 1898, have all been noted in the columns of your *Journal.*

Sailing from Sydney, C.B., July 7, 1898, on August 13 the preliminary summer's work of hunting walrus and recruiting natives and dogs among the Whale sound Eskimo was completed, and the *Windward* headed north from Etah, while my auxiliary ship, the *Hope*, steamed south for home. Five days later the *Windward* had fought her way through heavy ice under Cape D'Urville on the northern side of Princess Marie bay. Here further progress was stopped by a large floe, one end resting against the shore, and the other extending out into the dense pack, completely blocking the shore lead. This proved to be the end of the *Windward's* journey. No opportunity to advance offered, and on the last day of August the new ice was 4½ inches thick. A large portion of my supplies and stores were landed, the boiler was blown off, and preparations for the winter were commenced.

The autumn work outlined itself. It comprised three items—the survey of the Buchanan strait, Hayes sound, and Princess Marie bay region; the securing of a winter's supply of fresh meat for my party; and the transportation of the maximum amount of supplies northward along the coast. The first object was accomplished in September, demonstrating the continuity of Ellesmere and Grinnell lands; the non-existence of Hayes sound; that Buchanan strait is in reality Buchanan bay, and Bache island Bache peninsula. Incidentally, the existence of bear, musk-oxen, walrus, and hare in the Bache peninsula region was determined. The northern shores of Princess Marie bay were particularly barren of animal and vegetable life, only a rare hare being seen. On October 7 the second object was accomplished by the killing of a herd of seventeen musk-oxen on the eastern part of Bache peninsula. By incessant effort, utilizing every bit of the moonlight, and working much of the time in entire darkness, I had on December 4 3300 lbs. of supplies cached at Cape Wilkes, on the north side of Richardson bay, with smaller intermediate caches between Cape Wilkes and the ship. No one who has not had the actual experience can imagine the work and annoyances involved in transporting, in semi or complete darkness, these supplies along the frightful icefoot which everywhere lines the ragged Grinnell Land coast.

On December 20, 1898, I left the *Windward* with a party of six men and thirty dogs—all that remained of the sixty odd with which I left Etah. Advancing the Cape Wilkes cache to Cape Lawrence, though seriously hampered by thick weather, heavy winds, and deep snow, I then pushed on with light sledges in an attempt to reach Fort Conger. Unfortunately, the delays had thrown us past the period of moonlight into the uninterrupted darkness of the very midnight of the "great night." The icefoot grew steadily worse as we advanced, until it became almost impassable for our comparatively empty sledges. At Cape Defosse

our supplies gave out. At Cape Cracroft we were obliged to dig a burrow in a snow-drift, where I left two Eskimo and nine of the poorest dogs. Two more marches, one of eighteen hours' duration, during which, in complete darkness, we stumbled and fell and groped our way across the Cimmerian chaos of broken and snow-covered ice which filled Lady Franklin bay, brought us to the northern shore. Here a dog was killed for food, and, pushing on without sleep, we stumbled into Conger just after midnight on January 6.

Here I found that both my feet were seriously frozen, and, as a result, I lay on my back through the winter until February 19, when the beginning of the returning light enabled us to attempt the return to the ship. During this time we lived largely on cornmeal and molasses, and kept as warm as was possible by burning boxes and barrels. Lashed down upon a sledge, my feet and legs wrapped in a musk-ox skin, the return to the *Windward*, a distance of some 250 miles, was effected in eleven marches, my companions walking the entire distance. The mean minimum daily temperatures during this time was −53°·18 F.; the lowest, −65° F.

On March 13 the amputation of eight of my toes was effected, and on April 19 I started for Conger again, returning to the ship on May 31. In this journey the material abandoned by Greely at Conger was invoiced, twenty-five musk-oxen killed in the vicinity of the fort, and cached for future use, and an attempt made to reconnoitre the north-west Greenland coast. A reconnaissance from the summit of Cape Beechey showed Robeson channel to be filled from shore to shore with upheaved floe fragments covered with deep snow, and uninterrupted by large floes or areas of young ice. Crippled as I was, and unable to take my usual place ahead of the sledges, breaking a path with my snowshoes, the traverse of the channel was an impossibility.

A month's rest at the ship put my feet, which had become irritated with constant use, in better shape, and on June 29 I started west to complete the details of the Princess Marie bay—Buchanan strait region, and endeavour to cross to the west coast. From this trip I returned to the ship on July 28. The return journey was somewhat disagreeable, owing to the rotten state of the one-year ice, and the deep pools and canals of water on the surface of the old floes. These presented the alternative of making endless *détours*, or wading through water often waist and chest deep. Our clothing, tent, sleeping-gear, and food were constantly saturated, and on more than one occasion we slept in several inches of slush. But I felt repaid by the results of this trip. In spite of the lateness of the season and the handicap of my still unhealed feet, I had been fortunate in crossing the Ellesmere Land ice-cap, and from elevations of 4000 and 4700 feet had looked down upon the snow-free western side of Ellesmere Land, and out into an ice-free fjord extending some 50 miles to the north-west, beyond which appeared yet more

distant land. The season on this coast was at least a month earlier than on the east side, where the ice of Princess Marie bay, though much fissured, was still practically intact, and the general appearance of the country reminded me strongly of the Whale sound region of Greenland. The game secured during this trip comprised one polar bear, seven musk-oxen, three bearded seals, fourteen ordinary seals, and a few hare.

On August 2 the *Windward* got away from her winter quarters, and, after six days' struggle with the ice, reached comparative open water and proceeded to Etah. Convinced of the thorough unsuitability of the *Windward* for any attempt to push farther north, I had decided to

CAPE LAWRENCE, FROM THE SOUTH.

establish my base for the coming year at Etah. The year, though not marked by any startling results, had been a year of hard and continuous work for the entire party. During the year I obtained the material for an authentic map of the Buchanan bay—Bache peninsula—Princess Marie bay region; crossed the Ellesmere Land ice-cap to the west side of that land; established a continuous line of caches from Cape Sabine to Fort Conger, containing some fourteen tons of supplies; rescued the original records and private papers of the Greely expedition; fitted Fort Conger as a base for future work; and familiarized myself and party with the entire region as far north as Cape Beechey. Finally, discouraging as was the accident to my feet, I have been satisfied, since my

effort to reach the north-west coast of Greenland from Conger in May, that the season was one of extremely unfavourable ice-condition north of Cape Beechey, and doubt, even if the accident had not occurred, whether I should have found it advisable, on reaching Cape Hecla, to attempt the last stage of the journey. During August both ships hunted walrus, and the last of the month left me at Etah, and steamed south. The fall and winter passed without special incident. After the middle of December continuous communication was effected with the Stein party at Cape Sabine.

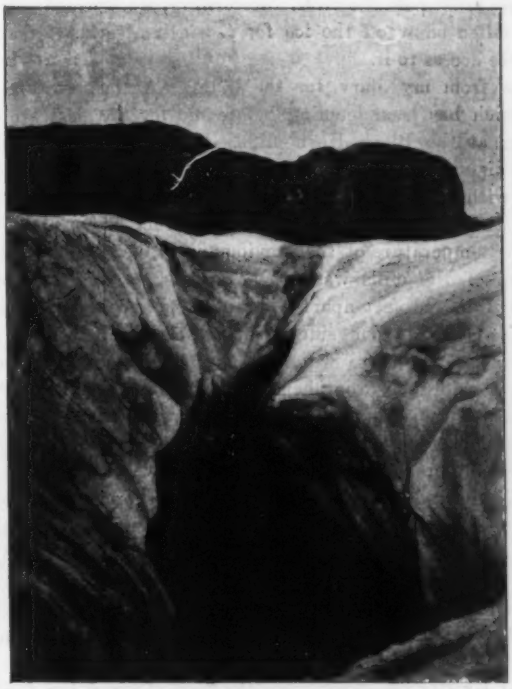
On March 4 I left Etah with the third and rear division of my party, bound for Fort Conger. Two other divisions had left on February 19 and 26 respectively. On the 28th I reached Conger, twenty-four days from Etah, during six of which I had been held up by storms. The other two divisions had preceded me by two or three days. The process of breaking in the tendons and muscles of my feet to their new relations, and the callousing of the amputation scars in this the first serious demand upon them, had been disagreeable, but was, I believed, final and complete. I felt that I had no reason to complain.

On leaving Etah, I had not decided whether I should go north from Conger *viâ* Cape Hecla, or take the route along the north-west coast of Greenland. Now I decided upon the latter. The lateness of the season and the condition of my dogs might militate against a very long journey, and if I chose the Hecla route and failed of my utmost aims, the result would be complete failure. If, on the other hand, I chose the Greenland route, and found it impossible to proceed northward over the pack, I still had an unknown coast to exploit, and the opportunity of doing valuable work. Later developments showed my decision to be a fortunate one.

I planned to start from Conger on April 9, but stormy weather delayed my departure until the 11th, when I got away with seven sledges. At the first camp beyond Conger my best Eskimo was taken sick, and the following day I brought him back to Conger, leaving the rest of the party to cross the channel to the Greenland side, where I could overtake them. This I did two or three days later, and we began our journey up the north-west Greenland coast. As far as Cape Sumner we had almost continuous road-making through very rough ice. Before reaching Cape Sumner we could see a dark water-sky lying beyond Cape Brevoort, and knew that we should find open water there.

From Cape Sumner to the Polaris Boat camp in Newman bay we cut a continuous road. Here we were stalled until the 21st by continued and severe winds. Getting started again in the tail end of the storm, we advanced as far as the open water a few miles east of Cape Brevoort, and camped. This open water, about 3 miles wide at our end, extended clear across the mouth of Robeson channel to the Grinnell Land coast, where it reached from Lincoln bay to Cape Sheridan. Beyond

it to the north and north-west, as far as could be seen, were numerous lanes and pools. The next day was devoted to hewing a trail along the icefoot to Repulse harbour, and on the 23rd, in a violent gale accompanied by drift, I pushed on to the Drift point of Beaumont (and later Lockwood), a short distance west of Black Horn cliffs. The icefoot as far as Repulse harbour, in spite of the road-making of the previous day, was very trying to sledges, dogs, and men. The slippery side slopes, steep ascents, and precipitous descents wrenched and



VIEW ON BENEDICT GLACIER.

strained the latter, and capsized, broke, and ripped shoes from the former. I was not surprised to see, from the Drift point igloo, that the Black Horn cliffs were fronted by open water. The pack was in motion here, and had only recently been crushing against the icefoot, where we built our igloo.

I thought I had broken my feet in pretty thoroughly on my journey from Etah to Conger, but this day's work of handling a sledge along the icefoot made me think they had never encountered serious work

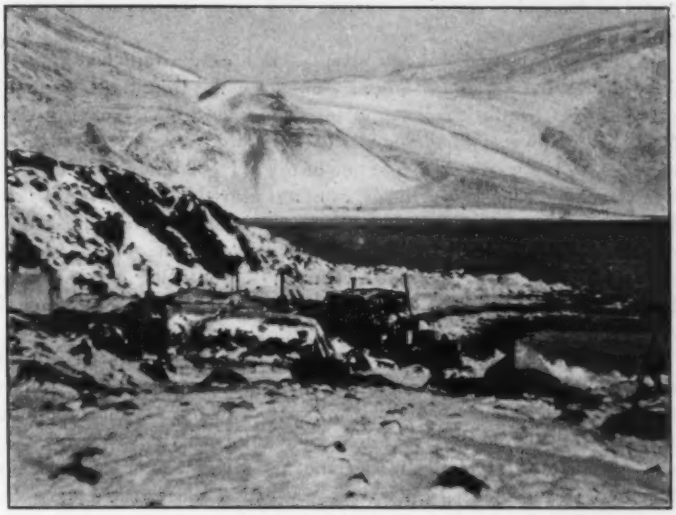
before. A blinding snowstorm on the 24th kept us inactive. The next day I made a reconnaissance to the cliffs, and the next day set the entire party to work hewing a road along the icefoot. That night the temperature fell to −25° Fahr., forming a film of young ice upon the water. The next day I moved up close to the cliffs, and then, with two Eskimo, reconnoitred the young ice. I found that, by proceeding with extreme care, it would in most places support a man. With experienced Ahsayoo ahead constantly testing the ice with his seal-spear, myself next, and two Eskimo following, all with feet wide apart, and sliding instead of walking, we crept past the cliffs. Returning, we brushed the thin film of newly fallen snow off the ice for a width of some 4 feet, to give the cold free access to it.

I quote from my diary for the 27th: "At last we are past the barrier, which has been looming before me for the past ten days, the open water at the Black Horn cliffs. Sent two of my men, whose nerves are disturbed by the prospect ahead, back to Fort Conger. This leaves me with Henson and three Eskimo. My supplies can now be carried on the remaining sledges. Still farther stiffened by the continuous low temperature of the previous night, the main sheet of new ice in front of the cliffs was not hazardous, as long as the sledges kept a few hundred feet apart, did not stop, and the drivers walked a few yards away to one side. Beyond the limit of my previous day's reconnaissance there were areas of much younger ice, which caused me considerable apprehension, as it buckled to a very disquieting extent beneath dogs and sledges, and, from the motion of the outside pack, was crushing up in places, while narrow cracks opened up in others. Finally, to my relief, we reached the icefoot beyond the cliffs and camped." The next day there was a continuous lane of water 100 feet wide along the icefoot by our camp, and the space in front of the cliffs was again open water: we had crossed just in time.

Up to Cape Stanton we had to hew a continuous road along the icefoot. After this the going was much better to Cape Bryant. Off this section of the coast the pack was in constant motion, and an almost continuous lane of water extended along the icefoot. A little west of Cape Bryant I killed two musk-oxen, the flesh of which my dogs highly appreciated. A long search at Cape Bryant finally discovered the remains of Lockwood's cache and cairn, which had been scattered by bears. At 3.30 p.m., May 1, I left Cape Bryant to cross the wide indentation lying between Cape Bryant and Cape Britannia. Three marches, mostly in thick weather, and over alternating hummocky blue ice and areas of deep snow, brought us at 1 a.m. of the 4th to Cape North (the northern point of John Murray island). From this camp, after a sleep, I sent back two more Eskimo and the twelve poorest dogs, leaving Henson, one Eskimo, and myself, with three sledges and sixteen dogs, for the permanent advance party.

From Cape North, a ribbon of very young ice, on the so-called tidal crack which extends along this coast, gave us a good lift nearly across Nordenskjöld inlet; then it became unsafe, and we climbed a heavy rubble barrier to the old floe-ice inside, which we followed to Cape Benét, and camped. Here we were treated to another snowstorm.

Another strip of young ice gave us a passage nearly across Mascart inlet until, under Cape Payer, I found it so broken up that two of the sledges and nearly all of the dogs got into the water before we could escape from it. Then a pocket of snow, thigh and waist deep, over rubble ice, under the lee of the cape, stalled us completely. I pitched the tent, fastened the dogs, and we devoted the rest of the day to



WINTER QUARTERS AT ETAH.

stamping a road through the snow, with our snowshoes. Even then, when we started the next day, I was obliged to put two teams to one sledge in order to start it.

Cape Payer was a hard proposition. The first half of the distance round it we were obliged to cut a road, and on the last half, with twelve dogs and three men to each sledge, push and pull them snow-plough fashion through the deep snow. Distant cape was almost equally inhospitable, and it was only after long and careful reconnaissance that we were able to get our sledges past, along the narrow crest of the huge ridge of ice forced up against the rocks. After this we had comparatively fair going, on past Cape Ramsay, Dome cape, across Meigs fjord,

as far as Mary Murray island. Then came some heavy going, and at 11.40 p.m., May 8, we reached Lockwood's cairn on the north end of the island. From this cairn I took the record and thermometer deposited there by Lockwood eighteen years before. The record was in a perfect state of preservation.

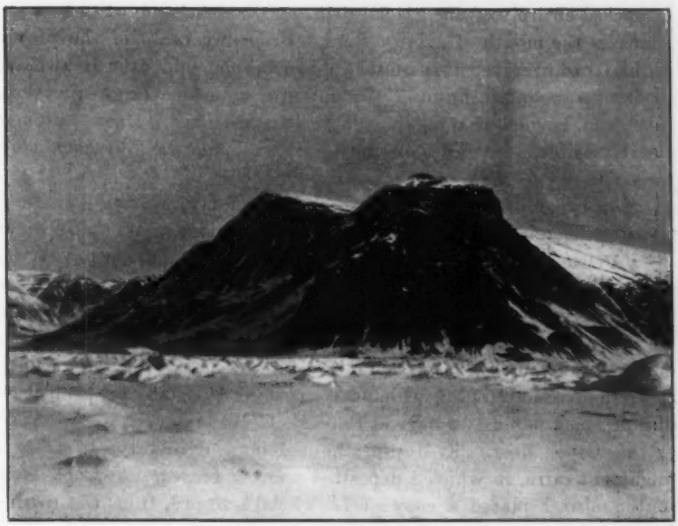
One march from here carried us to Cape Washington. Reaching the low point which is visible from Lockwood island just at midnight, great was my relief to see, on rounding it, another splendid headland, with two magnificent glaciers debouching near it, rising across an intervening inlet. I knew now that Cape Washington was not the northern point of Greenland, as I had feared. It would have been a great disappointment to me, after coming so far, to find that another's eyes had forestalled mine in looking first upon the coveted northern point.

Nearly all of my hours for sleep at this camp were taken up by observations and a round of angles. The ice north from Cape Washington was in a frightful condition, utterly impracticable. Leaving Cape Washington, we crossed the mouth of the fjord, packed with blue-top floebergs, to the western edge of one of the big glaciers, and then over the extremity of the glacier itself, camping near the edge of the second. Here I found myself in the midst of the birthplace of the "floebergs," which could be seen in all the various stages of formation. They are merely degraded icebergs—that is, bergs of low altitude detached from the extremity of a glacier, which has for some distance been forcing its way along a comparatively level and shallow sea-bottom.

From this camp we crossed the second glacier, then a small fjord, where our eyes were gladdened by the sight of a polar bear, which a couple of bullets from my carbine quickly transformed into dog-meat for my faithful teams. It was now evident to me that we were very near the northern extremity of the land, and when we came within view of the next point ahead, I knew that my eyes at last rested upon the Arctic *Ultima Thule*. The land ahead also impressed me at once, as showing the characteristics of a musk-ox country. This point was reached in the next march, and I stopped to take variation and latitude sights. Here my Eskimo shot a hare, and we saw a wolf-track and traces of musk-oxen. A careful reconnaissance of the pack to the northward, with the glasses, from an elevation of a few hundred feet, showed the ice to be of a less impracticable character than it was north of Cape Washington. What were evidently water-clouds showed very distinctly on the horizon. This water-sky had been apparent ever since we left Cape Washington, and at one time assumed such a shape that I was almost deceived into taking it for land. Continued careful observation destroyed the illusion. My observations completed, we started northward over the pack, and camped a few miles from land.

The two following marches were made in a thick fog, through which

we groped our way northward, over broken ice and across gigantic, wavelike drifts of hard snow. One more march in clear weather over frightful going, consisting of fragments of old floes, ridges of heavy ice thrown up to heights of 25 to 50 feet, crevasses and holes, masked by snow, the whole intersected by narrow leads of open water, brought us at 5 a.m. on the 16th to the northern edge of a fragment of an old floe bounded by water. A reconnaissance from the summit of a pinnacle of the floe, some 50 feet high, showed that we were on the edge of the disintegrated pack, with a dense water-sky not far distant. My hours for sleep at this camp were occupied in observation, and making a transit profile of the northern coast from Cape Washington eastward.



CAPE LOUIS NAPOLEON.

The next day I started back for the land, and, having a trail to follow and no time wasted in reconnaissance, reached it in one march and camped. Leaving this camp on the 18th, as we were travelling eastward on the icefoot an hour later, I saw a herd of six musk-oxen in one of the coast valleys, and in a short time had secured them. Skinning and cutting up these animals, and feeding the dogs to repletion, consumed some hours, and we then resumed our march, getting an unsuccessful shot at a passing wolf as we went.

Within a mile of our next camp a herd of fifteen musk-oxen lay fast asleep. I left them undisturbed. From here on, for three marches we reeled off splendid distances over good going in blinding sunshine, and

in the face of a wind from the east which burned our faces like a sirocco. The first march took us to a magnificent cape, at which the northern face of the land trends away to the south-east. This cape is in the same latitude as Cape Washington. The next two carried us down the east coast to the 83rd parallel. In the first of these we crossed the mouth of a large fjord, penetrating for a long distance in a south-westerly (true) direction. On the next, in a fleeting glimpse through the fog, I saw a magnificent mountain of peculiar contour, which I recognized as the peak seen by me in 1895, from the summit of the interior icecap south of Independence bay, rising proudly above the land to the north. This mountain was then named by me Mount Wistar. Finally, the density of the fog compelled a halt on the extremity of a low point composed entirely of fine glacial drift, and which I judged to be a small island in the mouth of a large fjord. From my camp of the previous night I had observed this island (?), and beyond and over it a massive block of a mountain forming the opposite cape of a large intervening fjord, and beyond that again another distant cape. Open water was clearly visible a few miles off the coast, while not far out dark clouds reached away to the south-east.

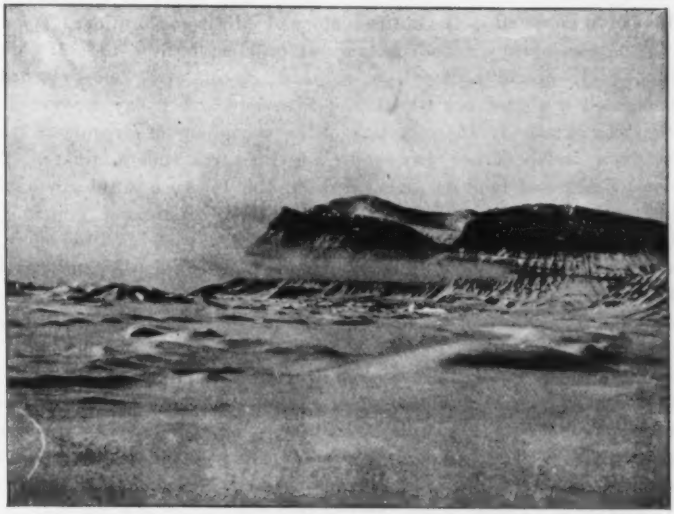
At this camp I remained two nights and a day, waiting for the fog to lift. Then, as there seemed to be no indications of its doing so, and my provisions were exhausted, I started on my return journey at 3.30 a.m. on May 22, after erecting a cairn, in which I deposited a record. The fog kept company with us on our return almost continuously until we had passed Lockwood island, but, as we had a trail to follow, did not delay us as much as the several inches of heavy snow that fell in a furious Arctic blizzard, which came rushing in from the polar basin, and prisoned us for two days at Cape H. L. Bridgman.

At Cape Morris K. Jesup, the northern extremity, I erected a prominent cairn, in which I deposited another record. At Cape Washington, also, I placed a copy of Lockwood's record, from the cairn at Lockwood island.

For a few minutes in one of the marches the fog lifted, giving me a magnificent panorama of the north coast mountains. Very sombre and savage they looked, towering white as marble with the newly fallen snow, under their low threatening canopy of lead-coloured clouds. Two herds of musk-oxen were passed, one of fifteen and one of eighteen, and two or three stragglers. Four of these were shot for dog-food, and the skin of one, killed within less than a mile of the extreme northern point, has been brought back as a trophy for the club.

Once free of the fog off Mary Murray island, we made rapid progress, reaching Cape North in four marches from Cape Washington. Clear weather showed us the existence of open water a few miles off the shore, extending from Dome cape to Cape Washington. At Black cape there was a large open water reaching from the shore northward.

Everywhere along this coast I was impressed by the startling evidences of the violence of the blizzard of a few days before. The polar pack had been driven resistlessly in against the iron coast, and at every projecting point had risen to the crest of the ridge of old ice along the outer edge of the icefoot, and, pouring over this, had descended upon the icefoot in a terrific cataract of huge blocks. In places these mountains of shattered ice were 100 feet or more in height. The old ice in the bays and fjords had had its outer edge loaded with a great ridge of ice-fragments, and was itself cracked and crumpled into huge swells by the resistless pressure. All the young ice which had



CAPE JOSEPH GOODE.

helped us on our outward passage had been crushed into countless fragments and swallowed up in the general chaos.

Though hampered by fog, the passage from Cape North to Cape Bryant was made in twenty-five and a half marching hours. At 7 a.m. on June 6 we camped on the end of the icefoot, at the eastern end of the Black Horn cliffs. A point a few hundred feet up the bluffs, commanding the region in front of the cliffs, showed it to be filled up by small pieces of old ice held in place against the shore by pressure of the outside pack. It promised at best the heaviest kind of work, with a certainty that it would run abroad at the first release of pressure. The next day, when about one-third the way across, the ice did begin to open out, and it was only after a rapid and hazardous dash from cake to cake that we reached an old floe, which, after several hours

of heavy work, allowed us to climb upon the icefoot at the western end of the cliffs. From here on, rapid progress was made again, three more marches taking us to Conger, where we arrived at 1.30 a.m., June 10, though the open water between Repulse harbour and Cape Brevoort, which had now expanded down Robeson channel to a point below Cape Sumner, and the rotten ice under Cape Sumner, hampered us seriously.

In passing, I took copies of the Beaumont English records from the cairn at Repulse harbour, and brought them back for the archives of the club. They form one of the finest chapters of the most splendid courage, fortitude, and endurance under dire stress of circumstances that is to be found in the entire history of Arctic explorations.

In this journey I had determined conclusively the northern limit of the Greenland archipelago, or land group, and had practically connected the coast south-eastward to Independence bay, leaving only that comparatively short portion of the periphery of Greenland lying between Independence bay and Cape Bismarck indeterminate. The non-existence of land for a very considerable distance to the northward and north-eastward was also settled, with every indication pointing to the belief that the coast along which we travelled formed the shore of an uninterrupted central polar sea extending to the pole, and beyond to the Spitzbergen and Franz Josef Land groups of the opposite hemisphere. The origin of the floebergs and palæocrystic ice was definitely determined. Further than this, the result of the journey was to eliminate this route as a desirable or practical one by which to reach the pole. The broken character of the ice, the large amount of open water, and the comparatively rapid motion of the ice, as it swung around the northern coast into the southerly setting east Greenland current, were very unfavourable features.

During my absence some thirty-three musk-oxen and ten seals had been secured in the vicinity of Conger. July was passed by a portion of the party in the region from Discovery harbour westward, *viâ* Black Rock vale and Lake Hazen, where some forty musk-oxen were secured. During August and early September various other hunting trips of shorter duration resulted in killing some twenty more musk-oxen. The middle of September I started with Henson and four Eskimo to Lake Hazen to secure musk-oxen for our winter supply, it being evident that no ship could reach us. Going west as far as the valley of the Very river, by October 4 ninety-two musk-oxen had been killed. Later nine more were secured, making a total of 101 for the autumn hunting. From the beginning of November to March 6, a large portion of the time was passed by the party in igloos built in the vicinity of the game killed, in various localities from Discovery harbour to Ruggles river.

On April 5 I left Conger with Henson, one Eskimo, two sledges, and

twelve dogs for my northern trip. At the same time the remainder of the party, with two sledges and seven dogs and pups, started south for Cape D'Urville and Sabine, to communicate with or obtain tidings of the ship. On reaching Lincoln bay, it was evident to me that the condition of men and dogs was such as to negative the possibility of reaching the pole, and I reluctantly turned back. Arriving at Conger, after an absence of eight days, I found the other party there. It had returned to Conger after an absence of four days, having proceeded one-third of the distance across Lady Franklin bay.

On April 17 I started south with the entire party, and reached the *Windward* at Payer harbour May 6. After a few days' rest, the

CAPE AT 83° 50′ N. LAT.

work of re-establishing caches along the coast northward towards Conger was commenced, and prosecuted till the middle of June. Then, having decided to make Payer harbour my base for the next year, all supplies, and the *Windward's* deckhouse, were landed for my use. On July 3, after several days' sawing, the *Windward* was freed from the ice. July was devoted to walrus-hunting, and after the arrival of the *Erik*, August 4, both ships engaged in the work. Late in August, after an attempt to reach Payer harbour, which was frustrated by heavy ice, I was landed with my party and walrus meat, in a small bight some 12 or 15 miles south of Cape Sabine, from whence I could proceed to Payer harbour in my boats or sledges when opportunity offered.

On September 16 I succeeded in reaching Payer harbour, crossing Rosse bay partly by sledge and partly by boat, and going overland across Bedford Pim island. Soon after this my Eskimo began to sicken, and by November 19 six of them were dead. During this time I personally sledged much of the material from Erik harbour to headquarters, and Henson went to the head of Buchanan bay with some of the Eskimo and secured ten musk-oxen. The winter passed quietly and comfortably. Two more musk-oxen were secured in Buchanan bay, and six deer at Etah.

On January 2 work was begun in earnest on preparations for the spring campaign, which opened on February 11. On this day I sent off six sledges, with light loads, to select a road across the mouth of Buchanan bay and build an igloo abreast of Cape Albert. At 9 a.m. on March 6 fourteen sledges trailed out of Payer harbour and rounded Cape Sabine for the northern journey, and at noon I followed them with my big sledge, the "Long Serpent," drawn by a team of ten fine greys. Two more sledges accompanied me. The temperature at the time was $-20°$ Fahr.; the minimum of the previous night had been $-38°$ Fahr. Henson had started on the 3rd, with six sledges and fifty dogs. We joined the others at the igloos abreast of Cape Albert, and camped there for the night. Temperature $-43°$ Fahr. The next day we made Cape D'Urville in temperatures from $-45°$ to $-49°$ Fahr. Here I stopped a day to dry our footgear thoroughly, and left on the morning of the 9th. Two sledges returned from here. Camped about 5 miles from Cape Louis Napoleon. The next march carried me to Cape Fraser, and the next to Cape Collinson. During this march, for the first time in the four seasons that I had been over this route, I was able to take a nearly direct course across the mouth of Scoresby bay, instead of making a long *détour* into it.

One march from Cape Collinson carried me to Cape Lawrence, on the north side of Rawlings bay. The crossing of this bay, though more direct than usual, was over extremely rough ice. Learning from Henson's letter at Cape Lawrence that I had gained a day on him, and not wishing to overtake him before reaching Conger, I remained here a day, repairing several sledges which had been damaged in the last march. Five men, with the worst sledges and poorest dogs, returned from here. Three more marches took us to Cape von Buch, on the north side of Carl Ritter bay, temperature ranging from $-35°$ to $-45°$ Fahr. Heavy going in many places. Two more marches carried us to the first coast valley north of Cape Defosse. I had now gained two days on the advance party. The character of the channel ice being such that we were able to avoid the terrible icefoot which extends from here to Cape Lieber, and my dogs being still in good condition, I made a spurt from here, and covered the distance to Conger in one march, arriving about an hour and a half after Henson and his

party. I had covered the distance from Payer harbour to Conger (some 300 miles) in twelve marches.

Four days were spent at Conger overhauling sledges and harnesses, drying and repairing clothing, and scouting the country as far as the Bellows in search of musk-oxen. None were seen, but about a hundred hare were secured in the four days. Temperatures during this time from −40° to −57° Fahr. Seven Eskimo returned from here, taking with them the instruments of the Lady Franklin Bay Expedition and other items of Government property abandoned here in 1883.

On the morning of the 24th I started north with nine sledges. We camped the first night at Depôt B. The next march I had counted on

A PRESSURE RIDGE.

making Lincoln bay, but just before reaching Wrangel bay a sudden furious gale, with blinding drift, drove us into camp at the south point of the bay. Here we were storm-bound during the 26th, but got away on the morning of the 27th, and pushed on to Cape Union, encountering along this portion of the coast the steep side slopes of hard snow which are so trying to men and sledges and dogs. Open water, the clouds over which we saw from Wrangel bay camp, was about 100 yards from our igloo, and extended from there, as I judged, northward beyond Cape Rawson, and reached entirely across the channel to the Greenland coast at Cape Brevoort, as in 1900. Fortunately, with the exercise of utmost care, and at the expense of a few narrow escapes and incessant hard work, we were able to work our sledges along the narrow and villainous

icefoot to and around Black cape. The icefoot along this section of coast was the same as was found here by Egerton and Rawson in 1876, and Pavy in 1882, necessitating the hewing of an almost continuous road; but a party of willing, light-hearted Eskimo makes comparatively easy work of what would be a slow and heart-breaking job for two or three white men. Beyond Black cape the icefoot improved in character, and I pushed along to camp at the *Alert's* winter quarters. Simultaneously with sighting the *Alert's* cairn, three musk-oxen were seen a short distance inland, which I went away after and secured. The animals were in poor condition, and their meat furnished a scant meal for my dogs. One march from here carried us to Cape Richardson, and the next under the lee of View point, where we were stopped and driven to build our igloo with all possible speed by one of the common Arctic gales. There was young ice, pools of water, and a nearly continuous water-sky all along the shore.

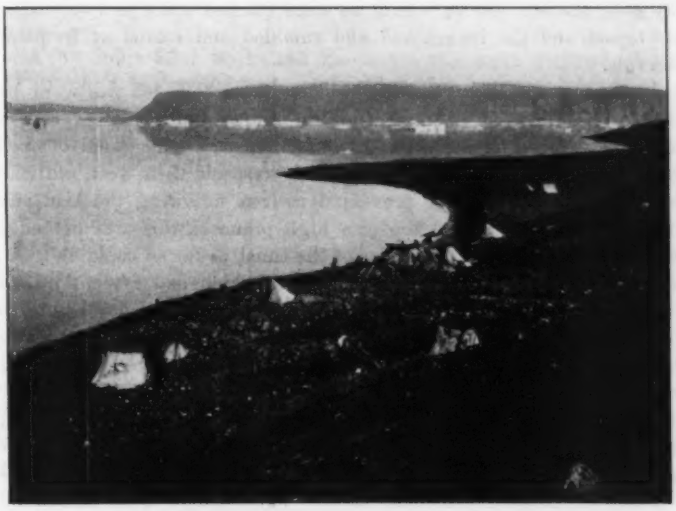
As the last march had been through deep snow, I did not dare to attempt the English short cut across Feilden peninsula, behind Cape Joseph Henry, preferring to take the icefoot route around it. For a short distance this was the worse bit of icefoot I have ever encountered. By the slipping of my sledge two men nearly lost their lives, saving themselves by a most fortuitous chance, with feet already dangling over the crest of an ice-precipice some 50 feet in height. At the very point of the cape we were obliged to pass the sledges along a shelf of ice less than 3 feet in width, glued against the face of the cliff at an elevation which I estimated at the time as 75 feet above the ragged surface of the floe beneath. On the western side of the cape the icefoot broadened and became nearly level, but was smothered in such a depth of light snow that it stalled us, and we went into camp. The next day we made Crozier island.

During April 2 and 3 we were held here by a westerly storm, and the 4th and 5th were devoted to hunting musk-oxen, of which three were secured, two of them being very small. From here I sent back three Eskimo, keeping Henson and four Eskimo with me. During this time reconnaissances of the polar pack northward were made with the glasses from the summit of the island and from Cape Hecla. The pack was very rough, but apparently not as bad as that which I saw north of Cape Washington two years before. Though unquestionably a hard proposition, it yet looked as though we might make some progress through it, unless the snow was too deep and soft. This was a detail which the glasses could not determine.

On the morning of April 6 I left Crozier island, and a few hours later, at the point of Cape Hecla, we swung our sledges sharply to the right, and climbed over and down the parapet of the icefoot on to the polar pack. As the sledges plunged down from the icefoot their noses were buried out of sight, the dogs wallowed belly-deep in the snow, and

we began our struggle due northward. We had been in the field now just a month. We had covered not less than 400 miles of the most arduous travelling in the severest season of the year, in temperatures of from −35° to −57° Fahr., and we were now just beginning our work, *i.e.* the conquest of the polar pack, the toughest proposition in the whole wide expanse of the Arctic regions.

Some 2 miles from the cape was a belt of very recent young ice, running parallel with the general trend of the coast. Areas of rough ice caught in this compelled us to exaggerated zigzags and doubling on our track. It was easier to go a mile round on the young ice than to attempt to force the sledge across one of these islands. The northern



KANGERDLOOKSOAH CAMP, WHERE PEARY LEFT HIS ESKIMO.

edge of the young ice was a high wall of heavily rubbled old ice, through which, after some reconnaissance, we found a passage to an old floe, where I gave the order to build an igloo. We were now about 5 miles from the land.

The morning of the 7th brought us fine weather. Crossing the old floe, we came upon a zone of old floe fragments deeply blanketed with snow. Through the irregularities of this we struggled, the dogs floundering almost useless, occasionally one disappearing for a moment; now treading down the snow round a sledge to dig it out of a hole into which it had sunk, now lifting the sledges bodily over a barrier of blocks; veering right and left; doubling in our track, road-making with snow-shoe and pickaxe. Late in the day a narrow ditch gave us a lift for a

short distance; then one or two little patches of level going; then two or three small old floes, which, though deep with snow, seemed like a God-send compared with the wrenching work earlier. We camped in the lee of a large hummock, on the northern edge of a small but very heavy old floe, every one thoroughly tired, and the dogs utterly lifeless, dropping motionless in the snow as soon as the whip stopped. We were now due north of Hecla, and I estimated we had made some 6 miles, perhaps 7, perhaps only 5. A day of work like this makes it difficult to estimate distances. This is a fair sample of our day's work.

On the 12th we were storm-bound by a gale from the north-west, which hid even those dogs fastened nearest to the igloo. During our stay here the old floe on which we were camped split in two with a loud report, and the ice cracked and rumbled and roared at frequent intervals.

In the first march beyond this igloo we were deflected westward by a lead of practically open water, the thin film of young ice covering it being unsafe even for a dog. A little farther on, a wide canal of open water deflected us constantly to the north-west and then west, until an area of extremely rough ice prevented us from following the lead any further. Viewed from the top of a high pinnacle, this area extended west and north-west on both sides of the canal as far as could be seen. I could only camp and wait for this canal, which had evidently been widened (though not newly formed) by the storm of the day before, to close up or freeze over. During our first sleep at this camp there was a slight motion of the lead, but it was still impracticable. From here I sent back two more Eskimo.

Late in the afternoon of the 14th the lead began to close, and, hastily packing the sledges, we rushed them across over moving fragments of ice. We now found ourselves in a zone of high parallel ridges of rubble ice covered with deep snow. These ridges were caused by the successive opening and closing of the lead. When, after some time, we found a practicable pass through this barrier, we emerged upon a series of very small but extremely heavy and rugged old floes, the snow on them still deeper and softer than on the southern side of the lead. At the end of a sixteen-hour day I called a halt, though we were only 2 or 3 miles north of the big lead.

During the first portion of the next march we passed over the fragments of very heavy old floes, slowly moving eastward, and were frequently obliged to wait for the pieces to crush close enough together to let us pass from one to the other. Further on I was compelled to bear away due east by an impracticable area, extending west, north-west, north, and north-east as far as could be seen, and just as we had rounded this, and were bearing away to the north again, we were brought up by a lead some 50 feet wide. From this time on, one day

was much like another, sometimes doing a little better, sometimes a little worse, but the daily advance, in spite of our greatest efforts, steadily decreasing. Fog and stormy weather also helped to delay us.

I quote from my journal for April 21—

"The game is off. My dream of sixteen years is ended. It cleared during the night, and we got under way this morning. Deep snow. Two small old floes. Then came another region of old rubble and deep snow. A survey from the top of a pinnacle showed this extending north, east, and west, as far as could be seen. The two old floes over which we had just come are the only ones in sight. It is impracticable, and I gave the order to camp. I have made the best fight I knew. I believe it has been a good one. But I cannot accomplish the impossible." *

A few hours after we halted, the ice to the north commenced like the sound of heavy surf, and continued during our stay at this camp. Evidently the floes in that direction were crushing together under the influence of the wind, or, what was perhaps more probable from the long continuation of the noise, the entire pack was in slow motion to the east. A clear day enabled me to get observations, which showed my latitude to be 84° 17′ 27″; magnetic variation, 99° W. I took some photos of the camp; climbed and floundered through the broken fragments and waist-deep snow for a few hundred yards north of the camp; gave the dogs a double ration; then turned in to sleep, if possible, for a few hours, preparatory to returning.

We started on our return soon after midnight of the 21st. It was very thick, wind from the west, and snowing heavily. I hurried our departure in order to utilize as much of our tracks as possible before they were obliterated. It was very difficult to keep the trail in the uncertain light and driving snow. We lost it repeatedly, when we would be obliged to quarter the surface like bird-dogs. On reaching the last lead of the upward march, instead of the open water which had interrupted our progress then, our tracks now disappeared under a huge pressure-ridge, which I estimated to be from 75 to 100 feet high. Our trail was faulted here by the movement of the floes, and we lost considerable time in picking it up on the other side. This was to me a trying march. I had had no sleep the night before, and to the physical strain of handling my sledge was added the mental tax of trying to keep the trail. When we finally camped it was only for a few hours, for I recognized that the entire pack was moving slowly,

* It is to be understood that the use of the word "impossible" here refers to the size of the party which I then had, and the severe handicap under which I had been compelled to work. With a party starting fresh from Cape Heela in February instead of April, and large enough to allow me to make a different disposition of the sledges and method of advance, the rate of advance over the same ice-conditions could be at least doubled.

and that our trail was everywhere being faulted and interrupted by new pressure-ridges and leads in a way to make our return march nearly, if not quite, as slow and laborious as the outward one. The following marches were much the same. In crossing one lead I narrowly escaped losing two sledges and the dogs attached to them. Arrived at the "grand canal," as I called the big lead at which I had sent two Eskimo back, the changes had been such as to make the place almost unrecognizable.

Two marches south of the "grand canal," the changes in the ice had been such, between the time of our upward trip and the return of my two men from the canal, that they, experienced men as they were in all that pertains to icecraft, had been hopelessly bewildered, and wandered apparently for at least a day without finding the trail. After their passage other changes had taken place, and, as a result, I set a compass-course for the land, and began making a new road. In the next march we picked up our old trail again.

Early in the morning of the 22nd we reached the second igloo out from Cape Hecla, and camped in a snowstorm. At this igloo we were storm-bound during the 27th and 28th, getting away on the 29th in the densest fog, and bent upon butting our way on a "bee-line" compass-course for the land. Floundering through the deep snow and rough ice, saved from unpleasant falls only by the forewarning of the dogs, we reached Crozier island after a long and weary march. The band of young ice along the shore had disappeared, crushed up into confused ridges and mounds of angular blocks. The floe at the island camp had split in two, the crack passing through our igloo, the halves of which stared at each other across the chasm. This march finished two of my dogs, and three or four more were apparently on their last legs. We did not know how tired we were until we reached the island. The warm foggy weather and this last march together dropped our physical barometer several degrees.

As we now had light sledges, I risked the short cut across the base of Feilden peninsula, and camped that night under the lee of View point. Four more marches carried us to Conger, where we remained three days, drying clothing and repairing sledges and giving the dogs a much-needed rest. Leaving Conger on May 6, eleven marches brought us back to Payer harbour on May 17. A few days after this I went north to complete the survey of the inner portions of Dobbin bay, being absent from headquarters some ten days. Open water vetoing a trip which I had planned for June up Buchanan bay and across to the west coast of Ellesmere Land, the remainder of the time was devoted to assiduous hunting, in order to secure a supply of meat for the winter in the contingency of no ship arriving.

On August 5 the new *Windward* sent north by the club, and bringing to me Mrs. Peary and my little girl, steamed into the harbour. As

soon as people and supplies could be hurried aboard her, she steamed across the sound to the Greenland side. Here my faithful Eskimo were landed, and after devoting a week or so to the work of securing sufficient walrus to carry them in comfort through the winter, the *Windward* steamed southward, and, after an uneventful voyage, arrived at Sydney, C.B., on September 17, after an absence of four years, three months and ten days.

The character of the North Greenland coast changes with startling abruptness and completeness at Cape Morris Jesup. The ragged coast-line from Cape Bryant to Cape Jesup, almost utterly devoid of life, and made up of precipitous capes and islands, with deep water close to, and the polar pack driving against their bases, gives way suddenly to a coast-line of sweeping curves, fronted by a wide zone of shoal water, and rising through a low foreshore to mountains a few miles inland. This coast is inhabited by a fauna practically the same as that of other Arctic lands several hundred miles further south.

This northern land differs from the Greenland shores from Cape York northward in that it is not an elevated tableland disappearing a short distance inland under the obliterating curves of the interior ice-cap, but is a region of mountain peaks, sharp and even ragged, on the slopes and in the valleys of which are disconnected *névés* that give birth to numerous glaciers of not great magnitude. I am under the impression that the Roosevelt range is a continuation of a circumpolar crest or ridge, of which the United States range in northern Grinnell Land is a portion. The motion of the sea-ice off this coast is sensibly eastward. A continued south-westerly wind will, at any season of the year, form a temporary polynia of considerable size at the northern end of Robeson channel. The "Grand canal" referred to in my paper quite probably marks the northern edge of the shoal which protrudes from the north coast of Grinnell Land.

Wherever we travelled in Ellesmere and Grinnell Lands traces of Eskimo were found as far north as Lincoln bay. Three of these finds were particularly interesting, viz. remains of two kayaks buried in the gravel just south of Carl Ritter bay (these kayaks of a type entirely unknown to the Whale sound and west side natives, their frames fastened together with strands of whalebone); two igloos, well up the bluffs in "The Bullows," at the western end of Discovery harbour, which my Eskimo thought must have been used at a time when the Bullows was an arm of the sea; a place near head of Sawyer bay, where the Eskimo had chipped flints for arrowheads.

On the Greenland coast no traces of Eskimo were seen, though I doubt not they would be found later in the season, with less snow on the ground, between Thank God harbour and Cape Bryant, and again from Cape Jesup south-eastward. Between Cape Bryant and Cape Jesup the ragged, precipitous, and utterly barren islands and headlands present

no places and no inducements for natives to camp except in the heads of the bays.

Bones of the whale were found as far north as Cape Defosse. At Cape Field, in Princess Marie bay, was nearly an entire skeleton. The capture or finding of this animal had evidently been the reason for the existence of a village of several igloos on the cape. Bones of the whale had been used in the construction of the houses.

Future Plans.

I have been asked to say something about my future plans. My plan of campaign requires but a few words. It contemplates the utilization of the utmost efforts and fullest resources of the Whale sound Eskimo; the use of dogs for traction power; a ship which shall drive me to the northern shore of Grinnell Land; and a refinement of methods and equipment (the result of years of experience) which will enable me to cover the distance from Grinnell Land to the pole and back between early February and June. My polar creed can be quickly stated. It contains three articles. It is held by many Americans beside myself, from that splended, vigorous, typical American personality who stands at our head, down.

(1) *The north pole should be attained.* As a matter of valuable accession to geographical knowledge, as a matter of prestige, it is a prize worth the utmost effort. The struggle for it has been going on nearly four centuries. Its attainment will be the sign of man's final conquest of the globe. Its non-attainment is to-day a reproach both to our boasted civilization and our alleged abilities.

(2) *The only practical route to the pole is the Smith sound route,* offering as it does a land base 100 miles nearer the pole than any other route, a less actively moving ice-pack, a wider base to which to return, and a practicable and well-known line of retreat to lower latitudes in the event of mishap to the ship.

(3) *The attainment of the pole is peculiarly an object for American pride and patriotism.* The North American world segment is our home, our natural ultimate destiny. Its bounds are the isthmus and the pole. We are negotiating for the isthmus; we must find and mark the pole. More than this, we want the pole because it is the pole, and because you, and we, and practically all the other civilized nations of the world have been trying for it for nearly four centuries, and have not got it yet, and because to win it will be the crown of these four centuries of effort and sacrifice and splendid heroism.

Before the reading of the paper, the President said: This evening we have to welcome our friend and associate and Gold Medallist, Commander Peary. It is seven years since he gave us that most interesting paper describing his famous land journey across Greenland. Since that time he has been for four and a half

years pegging away at that terrible ice, forcing his way to places where human foot never trod before, and now we, with great pleasure, find him looking as well as he was when he left us, and we rejoice to welcome him to this meeting to-night. I will now ask Commander Peary to address you.

After the reading of the paper—

Admiral Sir LEWIS BEAUMONT said: I think everybody must feel that we are indebted to Commander Peary for a most interesting and instructive lecture. I know that those who have come here, quite willing to receive him with a great deal of appreciation, must remember that on a former occasion he interested us even more than we expected; I think to-night he has surpassed himself. I am glad to say that there is no jealousy amongst Arctic explorers, and if there is any one here to-night who is ready to give him the meed of praise he deserves, it must be those who have had the privilege of being in those regions themselves. I think you will agree that to be four years in the Arctic Region is in itself a wonderful test of manhood and endurance, and to have accomplished, in addition to those four years, the extraordinary and wonderful journeys which we have just been told of, makes a record in Arctic history which stands almost unsurpassed. We have ourselves fellow-countrymen in the Antarctic Regions whom we are proud to think are doing their duty, and are succeeding. It yet remains to be known what they actually have done, but in the mean time, we must accord a full measure of praise and admiration to the wonderful perseverance and dogged courage with which Commander Peary has not only remained for four years this time, but has gone over and over again to the attack of these inhospitable regions and faced these trying and difficult journeys, these long winter nights, and at last reached one of the goals of his ambition—the northern point of Greenland. You may feel with me how much interest I have felt in these descriptions, when you know that I belonged to the English expedition which went into these same regions, and travelled over the very sites which Commander Peary has described in his long journey, passing the Black Horn cliff and making for Cape Britannia—which I was never fortunate enough to reach—while he has at last seen the unknown north, and planted the flag of the United States on the northern point of the continent of Greenland. It is, perhaps, not quite evident to those who have listened to the lecture to-night, that the results of Commander Peary's work are really more extraordinary and more deserving of admiration than one would suppose, without knowing the fact that he has had to commence something like 400 miles behind or further south than every one else who has been there—that is to say, than the well-equipped expeditions which have preceded him in recent times. It may interest you to know that the Hall Expedition in the *Polaris*, which comes first, though perhaps not very well equipped, was very fortunate, reaching Fort Conger without difficulty—that is to say, carrying its base up to 81° 47′ or 82°, and therefore was able to start from a point much nearer to the pole. The next expedition was the English expedition of 1875, which first reached Discovery harbour, where it left one of its ships, while the other, the *Alert*, went on to a point in lat. 82° 27′, the winter quarters of which were called Floeberg Beach; from there a party was able to make a journey north which resulted in reaching that point in the polar pack shown on the map, which even now Commander Peary has only just passed. It was a wonderful exploit, which met with all the difficulties we have heard of from Commander Peary, and that point was reached by Commander Markham, now Sir Albert Markham. The next expedition was the American expedition under Major Greely, now General Greely, who took up his position in Discovery harbour, and built the fort which he called Fort Conger, and from there he made his explorations and one of his officers was fortunate enough to make this long journey past the

point I was able to reach, making his last station at what is now called Cape Lockwood, and which has been passed by something more than 100 miles by Commander Peary. So you see that each expedition has, as it were, reached beyond the limits of the last one. I ought, in fairness to the English expedition, to explain that it was the last expedition ever undertaken with manned sledges, instead of sledges drawn by dogs. Up to that time the sledges had been drawn by men. They were heavy, and carried immense loads, because it was necessary that the men should have food, clothing, and protection from the weather at night. You will remember that they were all Englishmen—they were not Eskimo; they required shelter and food, so that the sledges drawn by men had great limitations. Directly the English expedition came home it was seen that the Americans had been right in making the long journeys with dogs, and from that time men have not drawn the sledges, but dogs have been used, and it is owing to that change in the system of exploration that great journeys have been successfully accomplished over the extent of difficult ice which exists to the north of Smith sound. Well, to come back to the point which made this explanation necessary. I want you to appreciate how great was the work done by Commander Peary; that, starting from halfway down Smith sound, 400 miles from the starting-point of the three other expeditions, he has accomplished more than they. I consider it is due first to the man himself, who has shown himself to be every inch a man, not only when such work had to be done, but also when the time of trouble and sorrow came, and he took care of his people at their dying moments, and not only took care of them, but saw that the extraordinary customs of the Eskimo should not rob those who were left of their children, and laid to rest those who died. I think the tenderness of those acts in the region where the hardness of life rather tends to make hardness of heart, is very much to the credit of Commander Peary. I need not say that what Commander Peary has told you of the future simply comes out of his great enthusiasm, which, it would seem, has not been daunted by all that he has gone through. It has been thought by those in England, who were aware of the difficulties of that route, that the pole was not attainable through the Smith sound passage. You have seen for yourselves the almost insurmountable difficulties that are opposed to advancing north over the pack itself. But Commander Peary has really become the expert in the matter, and we ought to give great consideration to his views. Another thing is that we have hitherto looked upon the attack of the polar pack from the point of view of Europeans undertaking it in more or less the form of a Government expedition, or, at all events, a large expedition, which throws an immense responsibility upon its commander and which to a very great extent hampers the freedom of his action. Now, in this case Commander Peary undertakes to do the attack by himself with dogs, which, of course, are absolutely necessary, and with the assistance of Eskimo—which is already half the battle won. Compared with a European who goes there for the first time, an Eskimo is worth three times more in dog-sledging; and more than that, Commander Peary goes there with a knowledge of the work to be done, and of the way to do it, which is unrivalled, and therefore, if it is possible for him in his ship to reach the furthest point that has been reached by a ship—that is, Floeberg Beach, 82° 27′, I believe that, with the courage which he has shown, and with the help of those Eskimo, who seem his very children, there may be a possibility of success, and no one will be more glad of it than those who have been there and seen the difficulties to be overcome. No one will welcome the fact that he has reached the pole more than this audience, which has received him so cordially to-night. I would like to add that there is an extraordinary feature, a very satisfactory feature, in his prospects from the point of view of one who has been an

Arctic explorer, and that is that in America there appears to be money ready and forthcoming to help him on his way. Well, we have countrymen who are working away south in the Antarctic, and who may want money themselves some day. Let us follow the example of those who are ready to help exploration, to help the men who are ready to risk their lives in the interest of science, and in the interest of that feeling which Commander Peary has so well described, the desire to conquer the world, and not allow any part of its area to remain undiscovered.

Colonel FEILDEN: In deference to our President, I rise to say a few words, but after the speech of Admiral Beaumont I have very little to add. I presume that our President would wish me to refer more especially to the natural history and scientific results of Commander Peary's Expedition. We should be, I think, very exacting if we expected Commander Peary, in the short space of an hour in which he had to condense his four years of Arctic travels, to give us any special reference to natural science. All those who are acquainted with Commander Peary's work must be well aware of the great value of the observations he has made in the Arctic Regions on his former expeditions, and I have not the slightest doubt that when his later observations are laid before the public they will be found equally valuable. Commander Peary, however, has incidentally referred in his paper to a most interesting problem, and that is, that on the furthest apex of the great island continent of Greenland, the nearest point to the north pole—in fact, only a distance of 360 geographical miles—he tells us he met various species of animals, even large flocks of ruminants, that ancient musk-ox, one of the most interesting animals on the Earth. Once it inhabited Great Britain, and its remains are found in the Pliestocene deposits of Europe and Siberia. The reason I draw attention to the fact of large mammals existing there is that it must be an object-lesson to many of our geologists who write of the total obliteration of life during the Glacial epoch. We see under the most glacial circumstances that can exist that life has not been obliterated, but it is able to get along apparently under the most adverse experiences. There are many points in Commander Peary's paper this evening that I could refer to, but I am afraid some are argumentative; but there is one very striking point, in which he tells us of the pressure-ridges against the seashore where the ice is forced up 100 feet against the shores and cliffs of the north part of Greenland. Now, when we think of the pressure that is required to force millions of tons of ice against the shore, moved by tide and winds with enormous velocity, it is apparent that there is no other power in nature except the volcano and the earthquake at all comparable to that of floating ice when pushed on the shore, and there are many speculations interesting to geologists to be derived from the consideration of the effects of floating ice. Therefore I think Commander Peary, in his paper, has given us two very interesting problems to consider—one the mammalian life existing within a short distance of the north pole; the other the great effects of floating ice on land surfaces.

The Hon. J. H. CHOATE, the American Ambassador: In the unfortunate position that I occupy, it seems to be thought that I can address any audience upon any subject. But, fortunately for you, we have something to-night of which I have no knowledge. Admiral Beaumont rather hesitatingly said that under favourable conditions there was a possibility that Commander Peary might reach the north pole. That is not the way I look at it. I put it much more briefly and tersely than that. I take the American view that of course he will get there, with such dauntless courage, such absolute determination, such earnest hope, and such magnificent experience as he has already had in the polar region. All America is very proud of Commander Peary. They have absolute faith in him; they have faith, from what he has already accomplished, that he will very soon finish the job, and so, with

your leave, I will say no more. I cannot add anything to the learning of the occasion, because I know nothing about it; but I have an absolute confidence that this real man, who represents us nearer to the pole than any other American has ever reached, will soon be there.

The PRESIDENT: It remains for the meeting to pass a vote of thanks to Commander Peary for this most interesting paper giving an account of his experiences, which are almost unequalled, and in some respects quite unequalled by any former explorations, and for the beautiful illustrations with which he illustrated his paper. There is only time for me to say how very cordially and heartily I agree with everything that Sir Lewis Beaumont said about the merits of Commander Peary. If he had not spoken, I should have said almost the same things myself. I now ask the meeting to pass a vote of thanks to Commander Peary for his paper this evening.

EXPLORATION OF FLUVIAL HIGHWAYS IN PERU.*

By Sir CLEMENTS MARKHAM, K.C.B., President R.G.S.

IN April, 1901, the Peruvian Government constituted a Committee of Fluvial Highways. Its duties are to propose exploring expeditions, to organize such expeditions when sanctioned, to protect industrial undertakings, and to manage the funds voted for these purposes. It consists of six members, the president being Dr. Don Eleodoro Romano, and one of its members being Don Eulogio Delgado, the president of the Peruvian Geographical Society.

The committee lost no time in organizing the work. Four expeditions were at once projected. The first was to explore and survey the short transit route between the basins of the Ucayali and Madeira discovered by Don Carlos Fiscarrald in 1894, and now known as the Fiscarrald isthmus.† The second was to explore the Tambopata river, and discover the extent of its navigability to its junction with the Madre de Dios. The third was to discover the lower course of the Inambari, previously quite unknown. A fourth expedition was to examine the upper Marañon in the far north of Peru, from Jaen to the famous Pongo de Manseriche. Reports of the results of these expeditions, which are of real geographical importance, have been received.

The most interesting expeditions, and those which will lead to the most important results, were those that achieved the discovery of the lower courses of the rivers Tambopata and Inambari, tributaries of the Madre de Dios. I explored the upper course of the Tambopata, and traversed the dense forest on its banks, when I was engaged in collecting chinchona plants for the Indian Government. The region from the

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* 'Vias del Pacifico al Madre de Dios.—Vias del Pacifico al Marañon.' Publicacion de la Junta de Vias Fluviales. Lima, 1903. Map, p. 724.

† See *Geographical Journal*, vol. vii. p. 189.

head of the Sandia ravine at Cuyo-cuyo to my furthest point in the Tambopata forests includes without exception the grandest and most beautiful scenery I have ever seen. Its natural products consist of chinchona bark, caoutchouc, vegetable gums, and excellent timber. Coca, coffee, and fruit trees are cultivated, and the cultivation may be extended almost indefinitely. The Inambari flows through a very rich auriferous region.

The expedition to explore the Tambopata last year consisted of the commissary, Don Juan Villalta, an engineer, a medical officer, a botanist, and a naval observer named Stiglich. Starting from Sandia, the expedition followed in my footsteps for the first 40 miles, and then pushed northwards through the forests to the head of canoe-navigation on the Tambopata. Here a station was formed, and named after me Port Markham. The expedition then descended the river in canoes to its junction with the Madre de Dios, where another station was established, and named Port Maldonado, after one of the earliest explorers of the great river, whose work was done half a century ago. A road is to be made from Port Markham to Sandia, and there will soon be telephonic communication. Careful meteorological observations were taken throughout the time, from May to October, 1902, and *Alferez de Fragata* Stiglich, with chronometer and sextant, fixed several positions, including Sandia.

In 1893 the Bolivian Colonel Pando, now president of that republic, had ascended the Madre de Dios from the Beni and reached the mouth of a stream which he took to be the Inambari, where the width was 325 yards, and depth 15 fathoms; and he was followed in 1894 by Dr. Ramon Paz.* In the same year Colonel Muños continued the exploration of the river system, and found cause for supposing that the river reached by Colonel Pando was not the Inambari, but the Tambopata.† Colonel Pando resumed his explorations in 1897, and confirmed the supposition of Colonel Muños, but the preliminary report issued by the Geographical Society of La Paz in 1898 leaves the routes followed by the colonel and his assistants somewhat uncertain. The journey of a French traveller, M. Viellerobe, also in 1898, added somewhat to our knowledge, as the position of the mouth of the Inambari was roughly fixed and the river ascended some 25 miles.‡ The Peruvian Fluvial Highway Committee entrusted the discovery of the course of the Inambari, from its headwaters to its junction with the Madre de Dios, to the engineer Don César Cipriani. The report of Señor Cipriani on the valley of San Gaban as a suitable region for colonization, on the caoutchouc industry, and on the river flowing through one of the richest gold-producing countries in the world, is of considerable value.

* *Geographical Journal*, vol. vii. p. 188. † *Ibid.*, vol. x. p. 443.
‡ *Ibid.*, vol. xiv. p. 214.

The fourth expedition from Eten on the coast to the upper Marañon as far as the Pongo de Manseriche and San Borja was conducted by the engineer Don Eduardo de Habich. His report has also been received, and is full of interest.

The reports are illustrated by photographs and by a series of maps based on positions fixed astronomically. They include accounts of the botany, and more elaborate reports on the diseases and climate of the regions, and on sources of food-supply.

These *montañas* to the east of the Andes, on the parallels between Cuzco and Lake Titicaca, are of deep interest. To some extent the forests were explored and even partially settled by the Incas. But practically, with the exception of the deep ravines on the eastern side of the Andes, they remained unknown to the Spaniards in colonial times. Much has been done, on the lower waters, by the Bolivians in recent years. Now the upper courses are being discovered and settled by Peruvian explorers. The settlement of these highly productive forest regions will, in the time to come, bring wealth and prosperity to Cuzco, the sacred city, and the dream of my heroic old friend, Father Bovo de Revello, will be realized. Meanwhile the Committee of Fluvial Highways, and the explorers who have worked so zealously and so diligently, deserve our hearty congratulations for the good geographical work they have achieved.

A map is necessary to make these explorations in a previously unknown part of South America clear and intelligible.

THE ALASKA BOUNDARY.*

By Colonel Sir T. H. HOLDICH, K.C.M.G., K.C.I.E., C.B.

In this month's number of the *Journal* will be found a map illustrating the main geographical features of the strip of territory which formed the subject of the Alaskan boundary dispute, a dispute which, in some of its chief contentions, forms a curious analogy to that which lately existed between Chile and Argentina in Patagonia.

Some little time ago the Argentine expert, Dr. F. P. Moreno, drew attention (in a paper which he read before the Society) to the general similarity in geographical conformation between the northern and southern Pacific coasts of America, so that it is not surprising that, so far as those issues are concerned which possessed a geographical bearing, there should be points of similarity in the contentions and the award.

In both cases the treaties were framed on an uncertain geographical basis, inasmuch as no accurate maps existed of the territories under

* Map, p. 724.

dispute. In both cases it was found that when the true geographical facts were known, the terms of the treaty admitted of divergent interpretation; and in both the arbitration tribunal has been compelled to fall back on the spirit and intention of the agreements from the consideration of the actual text. This has demanded a review of the political situation at the time the treaties were made, and a careful analysis of the extent of geographical knowledge which previously existed of the disputed areas.

It will be remembered that the South American treaty contemplated an ideal boundary which should at the same time be a main range, or mountain feature, and also a main water-parting, or divide. These two conditions being found incompatible in nature, an appeal was made to British arbitration to decide between them. Geographical facts did not fit the text of the agreement, and arbitration was the natural sequel of the provision made in the treaties, that in case of certain unexpected developments in the unknown topography of the Patagonian Andes, resort should be had to a concensus of expert opinion. The experts did not agree, and then it was that an independent tribunal was sought for. The tribunal could no more reconcile the existing geographical conditions to the text of the treaty than could the experts; and thus it was that the political motive, the intention, of the treaty finally demanded the most careful analysis. Now, if there was one feature in the "motive" more clearly indicated than another, it was the understanding that Chile was to retain absolute command of the western coast-line, to the exclusion of Argentine ports and settlements. This, then, became one (amongst others) of the guiding principles of the award, and a line was eventually defined which gave it full effect.

Within a year the same principle has received a new application under almost parallel circumstances. Once again, in the Alaskan arbitration, has the spirit of the treaty rather than its text shaped the final decision of the arbitrators. The original object of Russia to have "a fixed frontier, beyond which the English traders could not settle," rather than the literal interpretation of such terms as "coast-line" or "shore," has decided the result. Canada is "cut off from access to the sea over more than 4° of latitude, and, in particular, she is deprived of access to the Lynn canal to Yukon territory, the most convenient, and, at some seasons of the year, the only mode of access." Small wonder, then, that Canada is disappointed; but nobody who knows Canada can doubt that she will accept the disappointment with dignity and courage. She herself cannot possibly doubt the spirit of judicial fairness which has resulted in a British tribunal deciding against itself—for British and Canadian interests are one and the same, as Canada very well knows.

A geographical feature in the award of much interest is the

position of the four islands at the mouth of the Portland channel, two of which have been awarded to the United States, and two to Canada. The position of these islands may be studied on the Admiralty chart and in the valuable series of maps which have been presented to the Society by the Hon. Clifford Sifton. There is nothing in their geographical distribution which can enable us to form any conclusion as to the very divergent views expressed on their value by British and Canadian arbitrators. The verdict of the former is that Kannagunat and Sitklan (the two western islands) are of no importance; of the latter, that they are the "two which possess strategic value." If they are of no importance, the United States would hardly have made a point of claiming them. The fact that they are to the seaward of the islands Wales and Pearce certainly does indicate that they can to a certain extent neutralize the strategic value of the latter.

More than ever has it become apparent that a carefully constructed dictionary of geographical terms is a necessity which is pressing. Every boundary dispute which arises brings to light divergent interpretations of terms which we have been accustomed to regard as bearing a well-defined and permanent meaning. In this particular instance it is "coast-line," "shore," and "ocean" that face us with ambiguous limitations and indefinite extension. Are inlets a part of the ocean? Rivers are not so, we know; but where does a river end and an inlet begin if there is no delta or bar? Does the accident of an island being close to the "shore" of the mainland (when does land become "main," by the way?) make any difference as to the "oceanic" character of the straits between them? It would be quite impossible to frame a dictionary which would be absolutely comprehensive; but much may be done, and is, we believe, now being done, by literary experts connected with the Society to ensure a trustworthy reference for geographical terminology. It is much wanted.

THE REPUBLIC OF PANAMÁ.

By Colonel G. E. CHURCH.

ANOTHER turn of the historic kaleidoscope, and this time the *trait d'union* between North and South America is an independent state. What are the physical characteristics, the geographical advantages, the prospective means for existence possessed by this newly fledged commonwealth?

Its south-eastern boundary, if the old departmental limits be maintained, will follow the Serrania del Darien, which is the *divortium aquarum* between the basin of the river Atrato and its estuary and the valley of the Tuira, which drains into the Gulf of Panamá. The line commences in the little bay of Aguacate or Octavia, in front of point

Mazo or Morroquemado, and thence runs north-north-east, and then north along the summits which separate the rivers that flow to the Pacific from those which run to the Atlantic. Reaching the headwaters of the Juradó, it turns west towards the heights of Aspave. It then follows, generally in a north-east direction, the divide between the gulf of San Miguel and the river Atrato until it reaches the ocean entrance to the Gulf of Urabá, where it diverges north-west to the headwaters of the river Tarena, the course of which, until it empties into the Gulf of Urubá, serves as the most northern section of the boundary in question.*

The frontier with Costa Rica will, according to the award of President Loubet in 1900, start from Cape Mona, on the Caribbean sea, and enclose, on the north, the basin of the river Tarire (the lower course of which is sometimes called the Sixola), and then, by the watershed between the Atlantic and Pacific (which is the narrow-crested Cordillera of Talamanca), south-easterly to 9° S. lat.; thence, it will take a southerly direction and follow the divide between Chiriquí Viejo and the tributaries of the Gulf of Dulce, and terminate at Point Burica, on the Pacific ocean.

A great river, the Atrato, flows in a deep gorge northward into the Gulf of Urabá or Darien, and separates the "Occidental Cordillera" of Colombia from the outlying parallel coast range, washed by the waves of the Pacific ocean, and known as the Sierra de Baudo. This is generally low, its highest peak being only 6000 feet above the sea. Its average elevation is from 2600 to 3300 feet, and its lowest depressions from 1000 to 1600. It is a wild chaos of ridges, highlands, and spurs, terribly ravined by torrential rains, thickly forested, and rendered almost impassable by an infinite number of rivers, brooks, and tropical swamps and jungles—a pestiferous region uninviting as a home for man.

In the latitude of the Gulf of Urabá, the extension of the Sierra de Baudo pushes into the isthmus of Panamá, on the Pacific side, as far as the mouth of the river Bayamo or Chepo, where it completely disappears. *En route*, it breaks down to give place to the Bay of San Miguel and its tributary river system of the Tuira. South-east of this bay is a low *massif* called the Altos de Aspave, and north-west of it another culminating height, broadly spurred and counterforted, which connects by a transverse ridge with the low range which overlooks the Gulf of Darien.

The Altos de Aspave throws off, to the north-east, the Serrania del Darien, which crosses from the Pacific coast to the mouth of the Gulf of Urabá. Thence it skirts the Caribbean coast as far as Puertobelo, occasionally, for long distances, rising from the seashore in bold escarpments. Its principal summits are from 500 to 2700 feet above the sea.

* See Perez, 'Geografia Fisica de los Estados Unidos de Columbia.'

At the Chagres river, that *bête noire* of the Canal Company, the Sierrania del Darien completely breaks down, and the summit height between the two oceans is but 300 feet above sea-level. With the exception of the interoceanic water-divide in Nicaragua, which is 153 feet, it is the lowest break in the Andean and Rocky mountain chain between the straits of Magellan and northern Alaska.

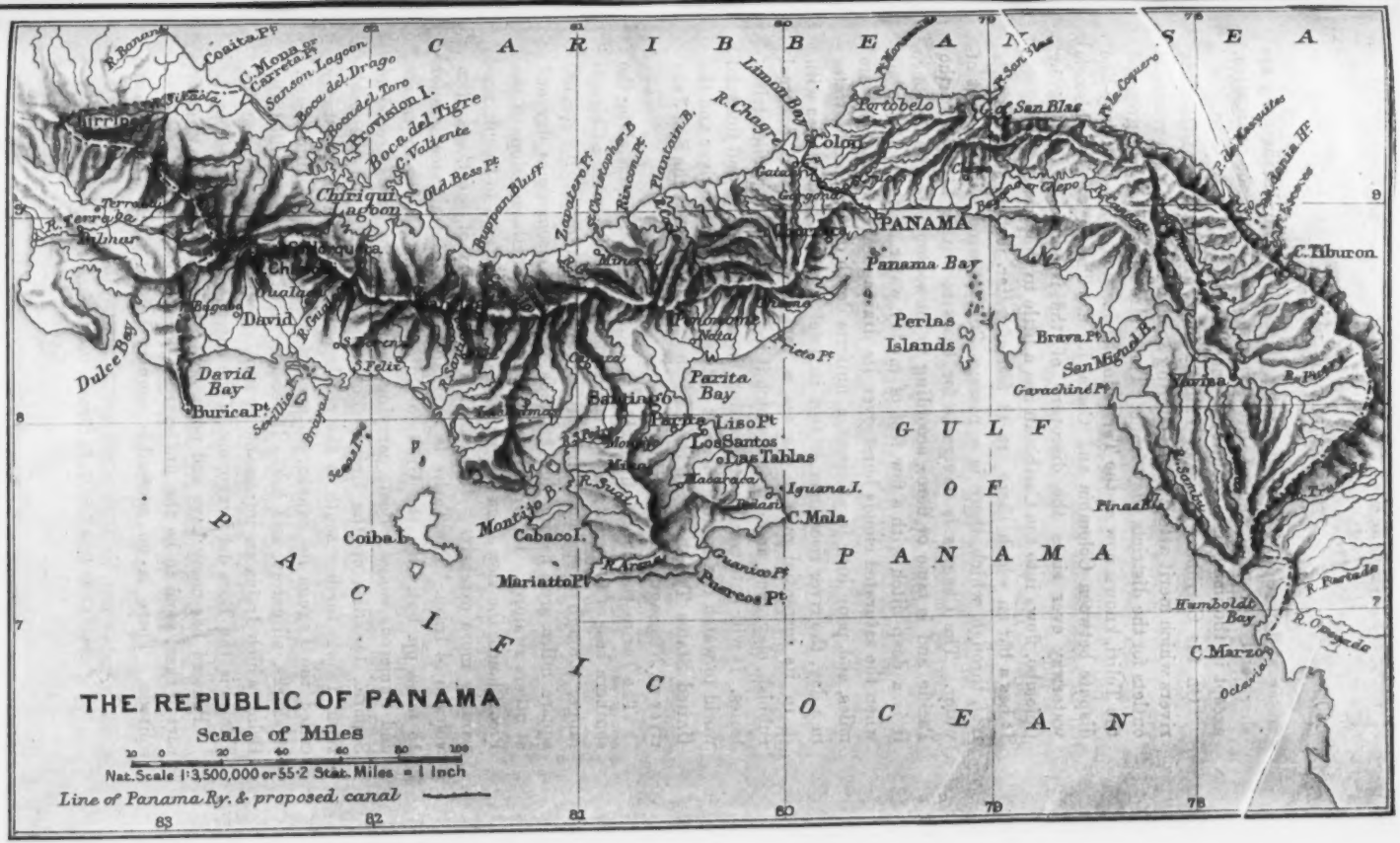
The orographic system of the western half of the isthmus of Panamá is bolder and better defined than that of the eastern portion. The region has a broad backbone ribbed by numerous counterforts, but occasionally broadening into complex belts of highlands and isolated *cerros*. From the Costa Rica frontier, the range takes the name of Sierra de Chiriquí, then Veragua, and afterwards is known as the Sierra de Panamá. In the first is the extinct volcano of Chiriquí, 11,000 feet * elevation above the sea, but the entire sierra has an average altitude of 6500 feet. The Sierra de Veragua presents us with the dome of Santiago, which rises to 9275 feet, while the Tuta reaches 5000 and the Santa Maria 4600. The Sierra de Panamá seems to be thrown broadcast into disorderly fragments without law or regularity, and its summits nowhere exceed an elevation of 1600 feet.

West of Montijo bay, on the Pacific side, a broad and massive mountain outwork forms the peninsula of Las Palmas, and between that and the bay of Panamá lies the great peninsula of Azuero, which shows a capricious, distinctive orographic system of highlands and *sierras*. Its bold headlands, which overlook the ocean, rise to an altitude of 3000 feet.

About 150 short rivers flow to the sea from the northern side of the isthmus, and over double that number drain its Pacific slope. The largest and most important is the Tuira, which rises in the Pirri mountains just north of the Bay of San Miguel, and empties into this. The Tuira is navigable for river schooners as far up as the first Spanish settlement, Santa Maria del Real; but, owing to the bars, they cannot ascend to Pinogava, which is the highest point reached by the tides. During the dry season, the river-bed above tidewater is a succession of rapids, beyond which the river dwindles into a small stream. The marks on the trees indicate a rise of 16 feet during the wet season, when the volume of water carried by the Tuira and its eleven main tributaries is immense. Its principal affluent is the Chucunaque from the north. It is nearly as large as the Tuira itself.

The Bayamo, or Chepo, rises in the same knot as the Chucunaque, but flows north-west and then west and south until it discharges into the Gulf of Panamá. It is about 150 miles long, and it is claimed that 120 miles of its course can be navigated by rafts and small craft. It has a wide estuary, the entrance to which has a bar with but 2 feet of

* 'Nueva Geografía de Colombia,' F. J. Vergara y Velasco.


C A R I B B E A N S E A
Caita Pt.
R. Banano
C. Mona
Carreta Pt.
Sanson Lagoon
Boca del Drago
Boca del Toro
Provision I.
Boca del Tigre
C. Valiente
Old Bess Pt.
Chiriqui Lagoon
Buppern Bluff
Terraba
R. Terraba
Palmar
David
Dulce Bay
David Bay
Burica Pt.
Sevilla C.
Brujas
Coiba I.
Montijo B.
Cabaco I.
Mariatto Pt.
R. Chagre
Limon Bay
Portobelo
Gulf of San Blas
Colon
Panama
Panama Bay
Perlas Islands
Brava Pt.
San Miguel B.
Garachine Pt.
Parita Bay
Parita
Los Santos
Las Tablas
Iguana I.
C. Mala
Pinas Bay
Yaviza
C. Tiburon
G U L F O F P A N A M A
P A C I F I C O C E A N
Guanico Pt.
Pueros Pt.
Humboldt Bay
C. Marzo
THE REPUBLIC OF PANAMA
Scale of Miles
10 0 20 40 60 80 100
Nat. Scale 1°3,500,000 or 55·2 Stat. Miles = 1 Inch
Line of Panama Ry. & proposed canal
83
82
81
80
79
78

water at low tide. The remaining streams, on the Pacific side, are short and torrential and of little value, even for canoe-navigation, except in the immediate vicinity of their mouths.

On the Caribbean slope of Panamá there are but two of its many rivers which merit attention, as offering some advantages as commercial outlets for the districts they drain. These streams are the Chagres and the Teliri, known now as the Tarire in the decision of the boundary-line dispute between Colombia and Costa Rica. The Chagres, a historic waterway ever since the discovery of the isthmus of Panamá by Colombo, flows into the Caribbean Sea a little to the west of Puertobelo. It has a bar on which there are 11 feet of water, just outside the Laja reef, through which there is a passage 70 feet wide with 14 feet of water. The Chagres is navigable for boats to within 14 miles of the Pacific, and is tame or fierce according to the season. In the dry one, it is a deep ditch with a few feet of muddy water at the bottom, but when the saturated clouds burst over its drainage area of 1000 square miles, and pour into it, at times, a uniform depth of 7 inches of water in a day, the river rises over 40 feet in twelve hours, and carries with it, in its torrential race to the sea, a vast mass of tropical, arboreal rubbish, clay, mud, and detritus which it receives from its swollen tributaries. It will be extremely interesting for the engineering and financial world to watch the coming contest between the Chagres river and the United States Treasury. In comparison to the Chagres, the San Juan river of Nicaragua is a plaything.

The Tarire, the mouth of which is in lat. 9° 34′ 14″ N., runs along the southern base of the great eastern counterfort of the Talamanca-Chiriquí range, through a spacious, undulating wooded valley of 100 to 150 square miles area, having low grounds which are sometimes dry and at others swampy. Its Urén branch rises on the north-east slope of the Pico Blanco, the view from the summit of which is said to be "incomparably more extensive" than that from the crest of the Costa Rica volcano of Irazú. The Tarire is navigable for light-draft steamers for 15 miles up, but, from the Urén to Gule, there are twenty-six rapids and numerous snags. Boats carrying half a ton of goods ascend to Sapurió, 1½ miles up the Urén. Between the Tarire and the small river Tilorio further south is the crooked, narrow, and deep estuary called the Laguna de Sansán, an ancient affluent of the Tilorio, full of sharks, alligators, and fish. It receives a little stream called the Dalni, which drains an impassable swamp. South-east of and near the Tilorio is the Boca del Drago, one of the entrances to Almirante bay.*

Panamá has many bays and ports on both oceans, but the greater part of them seem to be the undisturbed home of silence and primeval solitude. There is no accessible country behind them which offers

* See "Costa Rica," by G. E. Church, *Geographical Journal*, 1897.

an easy field for development. He is a bold pioneer who dares to throw down the gauntlet to nature in Panamá. There she displays her forces with magnificent *abandon;* the very ocean-margin is a wall of vegetation; nearly every swamp, hill slope, mountain-side, and gorge is densely packed with growth of tree, shrub, vine parasite, and grasses, forming a tangled jungle, sweating with the effort to maintain existence under the vertical rays of a tropical sun. The view is beautiful from the deck of a vessel, and no wonder that Luiz Colombo selected a part of "Castilla del Oro" as his fairyland, where his imagination might revel to the full, but which, unhappily, could yield him no other satisfaction. Four centuries have passed since he received his grant of ducal Veragua, and although it is within easy touch by sea with North America, it remains as the great Colombo discovered it, and as it was when for centuries it was the buffer region between Aztec and Ingarial civilization, so called. With the exception of bananas, no crop could be planted which would pay for clearing the lands of such a region, and keeping them cleared; and even bananas would not flourish sufficiently well if cultivated at an altitude exceeding 1500 feet above the sea. However numerous the ports and bays of Panamá on the Atlantic side, it is probable that many more centuries must pass before they become of any marked importance as commercial centres.

Starting from the Costa Rica boundary, the first great well-protected sheet of water is Almirante bay, which in reality is the north-western prolongation of the laguna of Chiriquí. Together they form a vast sheet of water. The former is 13 miles long from east to west, and varies in breadth from 2 to 13 miles. Its many harbours offer secure anchorage to ocean-going ships of the largest class, which may often moor alongside the shore. A low ridge of hills borders its southern side, in some places rising boldly to several hundred feet elevation, and 2 miles inland, reaching an altitude of 1700 to 2000 feet. The bay contains many large and small islands. Its main entrances from the sea are the Boca del Drago and the Boca del Toro, the former very tortuous, but having a depth of 9 fathoms of water; the latter offers 5 fathoms, but the channel is only a quarter of a mile wide, and bordered by coral reefs. The latter entrance gives its name to a small Colombian settlement supported principally by banana cultivation, the product being shipped to the United States.

The laguna of Chiriquí is 32 miles long and 12 wide, narrowing to 5 miles at its south-eastern extremity, and 10 at its north-western. Vessels of any draft may enter it from the ocean by the Boca del Tigre by an 8-fathom channel, and find ample security in 15 to 20 fathoms of water. The eastern and southern shores are low and swampy for a long distance inland, but at one point a spur of the Veragua range penetrates to within 2 miles of the south-eastern side of the laguna,

where it has an elevation of 2672 feet. The dense forest growth, which occupies the mountain-and-hill slope which surrounds nearly the whole of the Chiriquí laguna, extends upwards nearly to the water-divide between the northern and southern oceans, and, secure in its solitude, nature revels there in all the fantastic display of an exuberant vegetation. But, crossing the *serrania*, there is a marked change: the forests give way to grass lands along the mountain flanks towards the Pacific coast, and cultivated fields, pastures, and habitations of man indicate that here nature is in a less riotous mood. The distance from the Atlantic to the Pacific, across the district described, is 50 miles. The mountain slopes, owing to the ceaseless erosion of the rain-laden trade winds, are sharper on the Caribbean side than on the Pacific incline, which is also much dryer than the former. This is true of the whole isthmus—at least, that part west of the Gulf of San Miguel.

From the laguna de Chiriquí eastward to the river Chagres, the forbidding coast-line (of coral reef, sandy beach, mangrove swamp, and a few precipitous bluffs) has no sheltered anchorage. A heavy surf breaks continually along nearly the entire shore. To the westward of the Chagres river 25 miles, and to the eastward of it as far as Puertobelo, the shore is low and flat, and deadly exhalations from the swamps veil the interior of the country from view.

The so-called Bay of Colon, named in honour of Colombo, who discovered it in 1502, lies just to the east of the mouth of the Chagres river. It is poorly sheltered, and, being open to the north, is exposed to "northers," which frequently blow with such violence that the shipping is forced to run out to sea or seek shelter at Puertobelo. This place, historic in the colonial period of South America, and then the seat of the galeon trade between Spain and the West Coast, is a pestilential port without ventilation, owing to the high hills which enclose it on the north and south and prevent the winds from sweeping away the malignant miasma which constantly rises from the swamps on the east. A coral reef skirts the southern shore, and the city and the ruins of the castle of San Jerónimo are situated on the beach in the south-east corner. The width of the entrance to the port is 1¼ miles, but it soon narrows to half a mile. The depth of water gradually decreases to 7 fathoms. Puertobelo, as a harbour, is the best between Almirante bay and that of San Blas. In fact, there is no other worth mentioning.

Of San Blas, Commander Selfridge, who surveyed it, says, "It extends in a north-east and south-west direction some 20 miles, and is about 10 miles in extreme breadth. It is formed by the cape of San Blas and the outlying islands of the Mulatas archipelago, and is a most magnificent bay, with deep passages, and perfectly protected from the north winds in the dry season. In the north-west corner is an inner harbour formed by a circle of islands, with a passage leading into it. This

harbour is magnificent for all purposes required as the great terminus of an interoceanic canal." General E. W. Serrell says of the Bay of Mandinga, which is at the south-west side of the Gulf of San Blas, "The water is 80 feet deep within 100 feet of the shore, and nowhere less than 60 feet deep all the way into the Atlantic ocean." The width of the isthmus at San Blas, from ocean to ocean, is 37 miles. This is the shortest interoceanic distance on the Western Continent.

From San Blas bay, for a distance of about 80 miles, is the remarkable belt of cays, islands, and reefs known as the Mulatas archipelago. The cays are sandy and mostly in clusters, but little out of water, and thickly wooded. Between them are found many navigable channels. East of the Mulatas, and as far as Port Escocés, many cays also make the coast navigation dangerous and extremely difficult; but further towards the Gulf of Urabá, these obstructions cease to exist.

Between Point Sasardi and Point Escocés is a broad line of cays, sheltering what is known as Caledonia bay, in which are two harbours, the western called Sasardi, and the eastern one known as Caledonia. The former is about three-quarters of a mile in extent, with 4 to 6 fathoms of water; and the latter, the entrance to which is obstructed by dangerous shoals, has from 8 to 9 fathoms at the anchorage. The bold Atlantic frontage of the Serrania del Darien, from the Gulf of Urabá to Puertobelo, is thickly forested, and receives the full force of the north-east trade winds, with a resultant heavy rainfall.

Turning to the Pacific coast, we find the Gulf of San Miguel, or "Darien of the south," on the eastern side of the great shallow Bay of Panamá. At its head is the Bay of San Miguel, which was a great resort for the buccaneers, who reached it from Caledonia bay in ten days by one of the routes which served for communication between the two oceans by the Indian tribes before the discovery of America. The bay is over 6 miles wide at its mouth. It has plenty of water on its eastern side, but is shallow on its western one. As at Panamá, it has a tidal range of 20 feet or more, while Caledonia bay, on the Caribbean side, like Colon, is almost tideless. Darien harbour, at the head of the gulf or estuary of San Miguel, extends in a south-east direction up to the village of Chupigana, where it receives the Tuira and Savana rivers. Its deep water affords anchorage to the largest ships. Mangrove swamps, backed by thickly wooded hills, are almost continuous along its shores.

The island-filled Bay of Panamá, at the head of which is the famous city of the same name, is well known. It commences at Cape Garachina at the southern entrance of the Gulf of San Miguel, makes a majestic sweep concave to the south, and terminates at Cape Malo, which is the south-east cape of the great peninsula of Azuero. The direct distance between the two capes is about 100 miles. The northern part of the bay is shallow, and large ships have their anchorage near the famous island of Taboga, 9 miles south of the city of

Panamá. On this island Pizarro, Almagro, and Luque made their famous contract to discover and conquer the empire of the Ingas. The latter was cheated out of his share of the plunder, and Almagro was garroted in prison at Cuzco by the brother of Pizarro. Sailing-craft find it extremely difficult to get in or out of the Bay of Panamá, but especially out. It is one of the most tedious and difficult bits of navigation in the world. Pizarro was the first to try it, in November, 1525, but, after seventy days, was forced to abandon the effort to leave the bay; and it is still the similar experience of nearly every craft unaided by steam. It is a region of calms, doldrums, vexatious currents, squalls, rains, and tormenting heat.

The city of Panamá is situated on high ground at the foot of Ancon hill, but west of old Panamá, which was destroyed by the buccaneers under Morgan in 1673. To the mouth of the river Bayámo, about 25 miles, and for another equal distance to the south-east, the coast is flooded, and at low water mud flats are exposed for a distance of 3 miles from the shore; but further on, as far as the Gulf of San Miguel, the margin is higher, with occasional small hills. From Panamá south-west to the Bay of Parita, on the western side of the Bay of Panamá, the coast-line is considerably broken, and alternates between high and hilly ground and low flooded areas, the whole shore-line being generally of mud. The entire shore of the Bay of Parita is flooded land, and has a forbidding mud flat extending from 2 to 3 miles out. From this bay to Cape Malo, about 40 miles, the coast is well out of water and backed by the highlands of the peninsula of Azuero.

The southern front of this peninsula varies much in character; west of Cape Malo for about 25 miles, the lowlands soon give place to the escarpments of the cerros, which rise to a considerable altitude further inland, and the remainder of the frontage overlooks the ocean, the mountains, furrowed with gorges, pushing boldly down to the coast. The west side of the peninsula, which partly shelters the Gulf of Montijo, is high ground at times, and at others low with occasional beaches. It has many little bays, with a south-western exposure, which receive the torrents that descend from the mountains.

The Gulf of Montijo, penetrating north about 20 miles, has an opening of some 14 miles. The short river San Pedro flows in at its head, and is navigable for small craft about 17 miles up to the port of Montijo, where there is a little traffic. The gulf has several large and small islands, the principal one, Sabaco, lying off its mouth and completely sheltering it from the south winds.

West and north-west from the Gulf of Montijo, as far as the Bay of David, the coast for the first 20 miles is sharply defined: thence, as far as Espartal island, many hill spurs push down to the sea; the shore then becomes low and cut by numerous small streams. The whole coast, from Montijo's gulf to David bay, has many little bays, most of which

are available for vessels of very light draft. The bay last named is filled with cays, reefs, and hilly islands. At its head it receives the river David, which, with its tributaries, drain a vast amphitheatre of mountains which abut upon a broad plain surrounding the little port of David near the river delta. The river has its sources in the *serrania* of Chiriquí, and several of its branches drain the south-eastern slopes of the great volcanoes of Chiriquí and Horqueta, the latter 6600 feet elevation. West of the delta of the David, the coast-line bends in a great curve to the south until it reaches Point Burica at the termination of a peninsula formed by a rugged spur of the Chiriquí mountains.

The Pacific coast-line of the isthmus of Panamá is about one-third greater in extent than that of the Caribbean side. There are many islands along both coasts, but those on the Pacific are more numerous and larger than those on the Atlantic.

A thick, dark, primitive forest covers at least three-fourths of the state, and the vegetation in countless forms fights strenuously and ceaselessly with man for possession of the soil. It is nature's favourite tropical hot-house.

The extreme length of Panamá, from Colombia to Costa Rica, is about 480 miles, and it varies in width from 37 to 110. Its area is between 33,000 and 34,000 square miles, being more than one-half as large again as its last-named neighbour. About five-eighths of it consist of wild, unoccupied lands, and the remainder is but very rudely utilized by its inhabitants. The population was officially estimated, in 1898, at 340,000, representing such a heterogeneous amalgamation of Spanish, negro, and Indian blood, stirred together by the buccaneers of colonial times, that *white* may, in Panamá, be strictly classified as a colour. Until I saw a Panamá "army" of 150 men at drill, I had no idea that the human form could take such shapes and colours—Proteus would have envied them. And yet these men, like all the Colombians, are first-class fighters, and, well officered, are a foe not to be despised by the best troops ever likely to come into collision with them.

Panamá has but slender and insufficient resources to warrant its secession from Colombia. It is doubtful if the step would ever have been taken without external influence—the Panamá Canal company will probably save $40,000,000 by the change.

That Panamá can have an autonomous existence is doubtful. It is now simply a belt of country occupying a privileged geographical position, and must, for many years to come, rank with Honduras, unless the expenses of its administration be admitted as a first charge upon the net revenues of the projected canal, should there be any.*

* For an estimate of these revenues, and for details as to the projected Panamá Canal, see "Interoceanic Communication on the Western Continent," by G. E. Church, the *Geographical Journal*, March, 1902.

NATIONAL ANTARCTIC EXPEDITION.

THE following letter has been forwarded to Captain Scott through the Admiralty:—

1, Savile Row, W., October 9, 1903.

DEAR CAPTAIN SCOTT,

1. *Receipt of Letters.*—We, the President and Council of the Royal Geographical Society, have received your letters dated January 9, 1902, written off Cape Adare; January 22, 1902, off Cape Crozier; February 22, 1903, describing the position of the *Discovery* in winter quarters; and February 23, 1903, being your summary of proceedings during the winter and travelling season until the arrival of the *Morning*, with its enclosures containing short accounts of some of the sledge journeys; also your letter to the secretary of the expedition dated February 26, with five enclosures. We have endeavoured to give effect to your wishes and requests conveyed to us in your letters and their enclosures to the extent of our power and abilities.

2. *General Approval.*—We are impressed with the value of the work accomplished by your expedition, with the skill and sound judgment evinced in your conduct of the exploring work and in all your arrangements, and by the admirable way in which you have been supported by the officers and men under your command.

3. *Voyage of* 1902.—The exploratory voyage of the *Discovery* within the antarctic circle during the navigable season of 1902 secured all the objects for which we hoped and which are alluded to in your instructions. To a careful examination of the ice-barrier, including hydrographic and other scientific observations, you have added a balloon ascent of considerable interest, and the discovery of a continental land which you have appropriately named after His Majesty the King. It was fortunate that you were able to swing the ship successfully off Cape Crozier, to ascertain the disturbing effects of the iron on the instruments mounted in the magnetic observatory.

4. *Selection of Winter Quarters.*—Your selection of safe winter quarters under Mount Erebus, in so very high a latitude, has been fortunate both as regards the scientific observations and collections, and as a position whence important discoveries have been made. Your description, illustrated by the accompanying tracing, has given us a very clear idea of the position of the *Discovery* in her winter quarters.

5. *Autumn Travelling.*—Autumn travelling has always been the most severe kind of polar work, and the experiences of your officers and men were quite exceptional with regard to the perils and hardships they so manfully encountered. As you have observed, these experiences gained in the autumn were invaluable in the organization of the spring travelling. The men behaved admirably, but their knowledge was dearly bought by the loss of their comrade, poor George Vince, in the performance of an arduous duty. He had no near relations but his cousin, who has been communicated with. We hope a monument has been erected to his memory. We deeply regret that this sad accident should have cast a gloom on an expedition which, in all other respects, has been so prosperous.

6. *Work in the Winter.*—The steadfast and resolute way in which your staff conducted the scientific work during the winter under your superintendence and with your encouragement, has our warmest approval. Great praise is due to Lieut. Royds for his meteorological labours, to Mr. Bernacchi for the magnetic records obtained with the Eschenhagen instruments, and to Mr. Hodgson for his

indefatigable biological work, entailing frequent exposure for lengthened periods. We notice, also, the exceedingly valuable collection made by Dr. Wilson, and the botanical and geological researches of Dr. Koettlitz and Mr. Ferrar. We are also much pleased to know that the scientific staff always received all possible assistance, most zealously given, from their comrades, both officers and men.

7. *Winter Arrangements.*—You and your gallant companions have now passed through the rigours of two Antarctic winters. We realize the great trial to mind and body which such periods of hardship and exposure entail, and the necessity for healthy mental as well as bodily support in order to enable men to pass through it while preserving their health and spirits. Your care and that of your medical and executive officers has secured the great end as regards the first winter by attention to diet, ventilation, and exercise, and by those entertainments and intellectual amusements which drive away despondency and make the time pass pleasantly.

8. "*South Polar Times.*"—The *South Polar Times* does great credit to its editor, Mr. Shackleton, for it contains several really valuable and interesting articles, besides excellent humorous contributions. It is very satisfactory to find that the men joined with the officers in supporting the first Antarctic periodical, and that Mr. Dailey, Kennar, Quartly, and Wild were among the contributors. We trust that Mr. Shackleton, with the assistance of Dr. Keltie, will be successful in making arrangements for its publication, with the really beautiful illustrations by Dr. Wilson.

9. *Scurvy.*—The appearance of symptoms of scurvy in the spring must have been a source of great anxiety, but the prompt and efficient measures adopted by you with the advice of your medical officers seem to have been quite efficacious. Your belief that there will not be any recurrence of those symptoms will, we also believe and earnestly trust, have been borne out by the result.

Supply of Bad Provisions.—We do not propose to take any steps with regard to the supply of bad provisions until your return; but evidence has been taken from Mr. Spadaccini, and all the papers have been put together ready for any action in the matter that may be deemed advisable.

10. *Spring Travelling.*—We can only write in terms of the highest praise and admiration of the achievements of the expedition during the spring travelling, whether we consider the difficulties faced and overcome or the value of the discoveries. Your own memorable journey with your two companions, Shackleton and Wilson, when all the special and peculiar obstacles are considered, takes its place in the first rank of polar achievements. We await your full narrative with great interest, and we anticipate that the careful drawings of such an accomplished artist as Dr. Wilson will give additional value and interest to your results. The inland journey of Mr. Armitage, accompanied by Mr. Skelton, is unique of its kind, as it combines the hardships of polar travelling with the methods and appliances of Alpine climbing. The former experience of Mr. Armitage proved useful, and both officers merit high commendation for their remarkable journey, the scientific results of which cannot fail to be valuable. The discovery of the insularity of Mounts Erebus and Terror, and of the smaller volcanic islands, is due to the labours of Lieuts. Royds and Skelton, and to the various journeys of Dr. Koettlitz with other members of the scientific staff. Lieut. Barne's severe experience during the autumn fitted him to command the two important journeys in the spring, in the last of which he reached a latitude only second to your own. His care of the men forming his sledge cruise deserves the commendation you have given it.

11. *Conduct of Men.*—We particularly desire to express our approval of the

zeal and fine conduct of the men under your command. They have maintained the noble tradition of the navy whenever it has been employed on voyages of discovery. In all polar expeditions, since the return of that under Sir George Nares, travelling has been effected by means of dogs. Your gallant fellows have achieved their excellent results mainly without the aid of dogs; by sheer hard work, by a strong sense of duty, and by that indomitable pluck which has ever characterized the British sailor. Nor would we forget the sister service, so well represented by Lance-Corporal Blisset and by that resourceful young soldier, Gilbert Scott. We desire that you will tell the men how highly we appreciate their loya'ty to you and to their officers, and their splendid zeal and endurance to which the success of the expedition is so largely due.

12. *Details yet to come.*—We quite understand that time only allowed you to give us the barest outline of the results of the expedition in your reports and letters now under reply, and we look forward with great interest to the receipt of your complete results and conclusions after your return.

13. *Recommendations to the Admiralty.*—On receipt of your letter with recommendations respecting the men under your command, we sent a copy to the Lords Commissioners of the Admiralty, earnestly requesting that their service prospects may in no manner suffer from their prolonged absence. We received sympathetic replies, of which copies are enclosed, together with our forwarding letter. You will observe that all your recommendations have been complied with.

14. *Mr. Armitage and the P. & O. Company.*—The directors of the Peninsular and Oriental Steam Navigation Company were addressed with reference to the valuable services and prolonged absence of Lieut. Armitage, and a cordial reply was received.

15. *Arrangements for the Second Relief Voyage.* — On the arrival of the *Morning* at Lyttelton on March 26, 1903, orders were at once given to Captain Colbeck to attend to her repairs, to supply defects, and make other necessary arrangements. The stores contained in the list you transmitted were ordered, and their supply was placed under the superintendence of Mr. Shackleton. With regard to your indent for gun cotton and blasting gear, an application was made to the Admiralty for these stores to be supplied from Sydney. This has been done, and they will be taken to you by Captain Colbeck. The two large ice-saws were ordered at Dundee.

16. *Financial Position.*—The balance of the *Discovery* fund is only sufficient to pay the salaries and wages until October, 1904. It is necessary, therefore, that you should exercise all possible economy with regard to further expenditure.

Dr. Wilson and Mr. Hodgson: Increase of Salary.—You have, however, considerably reduced the wages bill, and we have great pleasure in complying with your request that the salaries of Dr. Wilson and Mr. Hodgson be increased by £50 each from the date of your letter.

17. *Application to Government.*—We have been obliged to apply to the Government for assistance for the present Relief Expedition, and for the needs of the *Discovery*. On June 20, the Secretary to the Treasury announced that the Government would undertake the Relief Expedition on condition that the ownership of the *Morning* was transferred to the Admiralty, her value being required as a set-off to the expenses of the Government. The vessel has been handed over to the Admiralty, who have undertaken all expenses and responsibility in connection with the present Relief Expedition.

18. *Relief Ships.*—Captain Colbeck has been retained in command, receiving his instructions from the Admiralty, and another vessel, we understand, has been added, the whaler *Terra Nova*. Both, we were informed, will be under Captain

Colbeck's orders on the outward voyage. We trust that the two ships will arrive in time to afford you active assistance in the work of breaking out of the ice. It is understood that, on the arrival of the relief ships, you will receive instructions respecting them from the Admiralty.

19. *Breaking out of the Ice.*—We have read your descriptions of the position of the *Discovery*, and your views respecting the ultimate prospect of the ship being freed. You are acquainted with all the former experiences relating to the extrication of ships from all quarters in the Arctic regions. You are possessed of the knowledge of the use of explosives; and you are supported by a chosen band of officers and men. If human forethought, skill, energy, and perseverance can free the *Discovery* from her icy prison, we are convinced that this great object will be achieved. If not, she will remain a monument of a memorable expedition. She will, we hope, not be derelict, but that you may be able to leave her securely moored in harbour.

20. *Return to Lyttelton.*—If the *Discovery* is released, she is to proceed to Lyttelton for the comparison of magnetic instruments and for repairs. If you have to return in the relief ship, you are to proceed to the same port.

21. *Return to Lyttelton. Further Arrangements.*—Be assured that, under any circumstances, on your return to Lyttelton proper arrangements will be made for furnishing you with the necessary credit to enable you to refit your ship at Lyttelton and bring her home. You will find a letter from us awaiting your arrival at Lyttelton, containing further instructions and an announcement of the arrangements we have been able to make. You are at once to telegraph your needs and wishes, and they will be supplied and complied with to the extent of our abilities. Details will be left entirely to your discretion.

22. *Return Home.*—We sincerely trust that you and your gallant companions will have passed through the second winter without injury to health, and that within another year your country will cordially welcome your return to home and friends with the fruitful results of your labours.

(Signed) Clements R. Markham,
President R.G.S.

REVIEWS.

AFRICA.

The Tawarek.

'A Search for the Masked Tawareks.' By W. J. Harding King. London: Smith, Elder. 1903.

To the *Journal* for November, 1902, Mr. Harding King communicated a short account of an excursion which he made in the spring of 1900 to the southern parts of the French Sahara, with the twofold purpose of studying the physical features of that region, and of interviewing a band of Hoggar (Ahaggar) Tuaregs, said to have just then pitched their tents in the neighbourhood of Tugurt. Permanent form is now given to that communication in the book under notice, which, however, contains a considerable amount of fresh matter, either collected at first hand by the author, or drawn from such recognized French authorities as MM. Duveyrier, Hanoteau, Mercier, and Bissnel. The author has a good eye for natural scenery, and is a shrewd observer of human character, and the result is a very readable and instructive volume, which is, moreover, enriched by a large number of photographic views of the land and its people taken on the spot.

For the geographer the chief interest lies in the section between Shegga and Tugurt, comprising the valley of the Wad Rirh—that is, the lower course of the Wad Igharghar, which in late Tertiary times carried a great volume of water from the Tasili and Ahaggar uplands for hundreds of miles across the now waterless Sahara northwards to the Aures escarpments, and thence through the region of the Shotts eastwards to the Mediterranean. These shallow surface waters are all that are still visible of that mighty Saharan artery. But after the French occupation, modern science was not long in piercing below the surface to the underground reservoirs along the course of the Wad Rirh valley, and tapping them for irrigation purposes. Our author gives a graphic account of the rude methods of reaching the water-bearing strata which had been in operation from remote times, and are now replaced by properly constructed artesian wells. The date-palm area has thus been greatly extended, and the French company that have taken this work in hand "have not only supplemented the supply of water in the existing oases, but have created several new oases of their own." Indeed, the success that has attended their efforts has produced a false impression, and because artesian wells have been profitably sunk along the bed of an underground waterway, it has been concluded that a great part of the Sahara might again be transformed to "a region flowing with milk and honey," as in Pliocene times. Some parts of the section traversed by the expedition are, however, still far removed from the popular idea of a boundless sandy waste, and we read that "the Sahara in the spring is a delightful country to travel in. The air, though warm, is usually wonderfully soft and invigorating. Mosquitoes are unheard of, and flies, the plague of most warm countries, are unknown beyond the oases."

The Ahaggars, a party of whom were interviewed and photographed by the author, form one of the main sections of the Saharan Hamites, who are commonly called *Tuáreg*, or *Tawárek* (plural of the Arabic *Tarki*, of doubtful meaning), but always call themselves *Imoshagh*, or *Imohagh* (plural of *Amoshagh*, or *Amohagh*, "free," "noble"). The Ahaggar section, whose domain extends from about 30° N. to the Tropic of Cancer between 0° to 7° E. over the rugged Tademagh, Tidikelt, and Muydir plateaux, forms a powerful confederacy of fierce and warlike tribes, who have hitherto presented the chief obstacle to the French advance across the Sahara to the Sudan. All are *Ahl el-Litham*, "veiled people," and comprise two social classes—the nobles, whose business is raiding and fighting, and who wear a black litham; and the Imghad, a servile class, who do all the work and wear a white litham. Hence the figure arrayed in black, which adorns the cover of this volume, is that of a noble, and Mr. Harding King writes me that it is not a fanciful design, but a real portrait from a photograph, though not from one taken by himself.

In an appendix "On the Origin of the Tawarek Alphabet," an attempt is made to trace this peculiar script to a Hellenic source; but the argument is not convincing, and breaks down at one or two material points. Still less satisfactory is the erratic spelling of geographical terms, which, like the Greek of "Ausonia," *sine lege vagantur*. There is little agreement between the text and the map, which present such variants as Tugurt and Tougourt; Kef el-Dohor, Kef ed-Dour, and Kef el-Dour; Milrir, Melrirh, and Melchir—this last quite an impossible (English) transliteration of the Arab form. In a future edition, this chaotic state of things should be reduced to order; the index also would admit of much enlargement, and a table of contents should be supplied.

A. H. KEANE.

Sierra Leone.

'The Advance of our West African Empire.' By C. Braithwaite Wallis. London: Unwin. 1903.

The comprehensive character of the title of this work is not quite justified by its actual scope, which is virtually limited to the one protectorate of Sierra Leone. The value of the book is not, perhaps, lessened by this limitation, but those who expect to find in it a general history of the recent development of British West Africa should be warned that this will not be the case. Captain Wallis went out to Sierra Leone under the orders of the Colonial Office early in 1898, and took an active part in the events of that troublous year, commanding one of the military columns engaged in the suppression of the native revolt, which, with its unspeakable atrocities, proved such a critical episode in the history of the colony. Captain Wallis sketches both the events which led up to this deplorable rising and the general course of the operations by which it was finally put down; not confining himself to his own share of the work, but describing, if at less length, the broad features of the campaign as a whole. The two main centres of the revolt were the Timini country in the north, where its instigator was the chief Bai Bureh, and the Mendi country in the south, where matters assumed an even more serious aspect; but of the whole area of the protectorate only the Koinadugu district in the north-east escaped contamination by the general disaffection. Captain Wallis brings out clearly both the formidable character of the rising—the most serious, perhaps, that has ever been faced by the British in West Africa—and the extraordinary difficulty encountered by those responsible for its suppression. Of the extraordinary secrecy, coupled with deadly determination, with which the Mendi revolt was organized, he gives a striking picture, and its outcome was a sequence of massacres and outrages, "the most terrible in the annals of our colonial history."

To the future historian of Sierra Leone the details supplied will be invaluable; but of wider interest, perhaps, is the light thrown on the general principles of British administration in the protectorate, which may serve in some degree as a sample of the policy adopted in our general dealings with the African race. As regards the motive of the rising, Captain Wallis shows clearly that it was not really a "tax-war," but a "slave-war," undertaken in the hopes of re-introducing practices prohibited under British rule, and that the imposition of the hut-tax merely supplied the excuse for an inevitable conflict between civilization and barbarism. He holds enlightened views as to the rules by which our conduct should be regulated in our endeavour to introduce civilization into the dark places of West Africa, showing that it is by making use of the native himself as an ally in the work that progress can alone be guaranteed. At the same time he realizes—and the revelations of fiendish cruelty of which the native in his natural state is capable put the fact beyond question—that there is much in the former *régime* so distinctly evil that it admits only of absolute suppression. Some good results in this direction have already been attained since the war, and the author was struck, on his return in 1902, with the immense strides already made. From the point of view of economic development, he is also disposed to take a sanguine view, insisting on the great natural resources of the country, but showing also the need of an energetic and enlightened policy. In this direction, too, it is only through the natives themselves that results of real value will be reached.

Southern Angola.

'Kolonial-Wirtschaftliches Komitee. Kunene-Sambesi-Expedition. H. Baum. 1903.' Herausgegeben von Prof. Dr. O. Warburg. Berlin: Kolonial-Wirts. Komitee and Mittler & Sohn. 1903.

As has already been mentioned in the *Journal*, an important expedition was sent out in 1899 by the German Kolonial-Wirtschaftliches Komitee, which is doing so much to bring about an improved knowledge of the colonial possessions of that country, with a view to the thorough examination of the economic resources (principally botanical) of South Angola. The expedition was most fruitful in results, which are here made public under the editorship of the well-known botanist, Dr. Warburg. It is probable that no one expedition has brought back from West Africa such a rich harvest of botanical *data* since the time of Welwitsch, whose labours, it will be remembered, had to do with this very region. They throw light, not only on the flora of Southern Angola, as composed of such and such individual species, but on the distribution and life-conditions of the plants as influenced by their physical surroundings. In all, no fewer than 350 pages of the work are taken up by the botanical results of the expedition.

The country traversed is perhaps one of the least-known parts of Africa from a purely geographical point of view, and as the routes diverged largely from those of the few previous travellers—Pinto, Capello and Ivens, and, in the more eastern parts, members of Major Gibbons's last expedition—a certain amount of new material has been gained in this direction also, even though the absence from the party of a trained surveyor prevented the opportunities presented for mapping the country from being utilized as they might. The map which accompanies the volume, which at first sight appears valuable from the considerable amount of detail inserted, is disappointing on closer inspection, from the evident untrustworthiness of the geographical co-ordinates, no attempt having been made to utilize the positions fixed by other travellers. This makes it almost impossible to correlate the *data* with those of previous maps, many of the features being laid a full degree at variance with their positions on Mr. Ravenstein's map of the results of Major Gibbons's expedition, given in the *Journal* for February, 1901. It is only in regard to the topographical details of previously unvisited districts that the map is likely to prove at all serviceable, and even these must be accepted with caution.

Some geographical information of value is, however, to be found in Herr Baum's narrative of the journey, which occupies the first 153 pages. The route led from Mossamedes by the valley of the Kakulovar to the Kunene, and up an eastern tributary of the latter to the upper Kubango. This was followed down through over 3° of latitude, after which the route led north-east to the Kwito, and thence east to the upper Kwando, the return being made by a more northerly route. Notes are given throughout on the nature of the surface features, especially the vegetation, the mode of cultivation by the natives, and so forth. Particular attention was given to the rubber-yielding plants, among which *Carpodinus chylorrhiza*, the roots of which are dug up to obtain the product, is the preponderating species. Its habitat is formed by the open sandy tracts surrounded by forest which occur between the watercourses, but are themselves waterless. The method of preparation of the caoutchouc is fully described and illustrated by photographs. The most characteristic tree of Southern Angola is the "Houtbosch" (*Berlinia Baumii*), the bast fibres of which are largely used for cordage, etc., while the bark serves to make boats.

Herr Baum considers that the fertile districts near the coast are well adapted

for cotton-cultivation, though at present only the sugar-cane is grown. Towards the west the soil of the interior plateau is generally loam or clay, capable of growing European cereals, vegetables, and fruits. East of the Kubango and Kwebe the country is characterized by streams with swampy banks and sandy hills between them, the rainfall permitting the cultivation of crops by the natives. This is also the principal rubber district. The timber supply is generally abundant, but the principal value of Southern Angola consists in its eminent adaptability for cattle-rearing.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Mediæval Cartography.

'Alcuni Cimelli della Cartografia Medievale esistenti a Verona.' By Giuseppe Crivellari. Firenze: Bernardo Seeber. 1903. (48 pp.)

This excellent monograph is principally devoted to an examination of the planisphere of Giovanni Leardo, executed in 1442, and now in the Communal Library at Verona (pp. 5–31); shorter studies are added, (α) on an unsigned portolano of the fifteenth century in the Capitular Library of the same city; (β) on the 1592 portolan of Jaume (or Jayme) Ollives of Majorca; and (γ) on the 1592 Atlas of Giacomo Scotto; also in the Verona Capitular Library. An excellent coloured reproduction of the Leardo planisphere is supplied at the end.

Leardo's planispheres of 1448 and 1452 were already well known to students of the later mediæval cartography, but the work of 1442 has not yet received general notice. A long inscription at the foot of the map tells us, in conclusion, *Johannes Leardus me fecit* 1442, and gives the following information: *Per—Il mapamõdo-sora-schrito-sepuo vedere chome latera-e le-ixolle-stano-nel mare el primo-circhollo-sie-dei*-12-*mesi de lano el segondo-sie-dei*-12-*segn çellesti-el terzo-sie della-rapo-della pasqua-chome nel*-1441-*adi*-16-*aprille-chonpie-nel chonpie-nel*-1535-*adi*-28-*marzo-che-so per ani*-46-*quãdo-se troua-nelle-chaxelleletere-M-quel ano la pasqua-vien-de marzo quãdo se troua-letera-A-quel ano la ue daprille-quãdo-se troua-B-quel ano chore Bixestro.* The design is absolutely circular in form, and measures 278 mm. in diameter; the mappemonde proper is encircled (1) by the months, (2) by the signs of the Zodiac, (3) by the calendar described in the foregoing inscription. In the left-hand lower corner is the legend *Mapa Mondi;* in the right-hand corner, over against this, are the words *Figura Mondi.* Jerusalem, as in the Leardo of 1452, is made the centre of the Earth; on the other hand, by the side of this concession to unscientific ideas, the portolano type of coast draughtsmanship appears in certain of the Mediterranean lands and in the Black sea, on the ocean-shores of Spain and Portugal, and in the British isles. The North African shore, at least from Centra as far as Tunis, is not badly drawn, and some of the Mediterranean islands are fairly well conceived; of distinct merit, also, is the draughtsman's delineation of the Crimean peninsula and the Sea of Azov, so thoroughly known to Italian traders of the later middle ages, not only from their Krim settlements at Kaffa and elsewhere, but also from their great factory at the mouth of the Don. This factory —Tana—appears upon the Leardo planisphere, as do the mountains of Gog and Magog in the far north-east of Asia (*montagna de og/ e magog doue so sera/ de moltitudina de tartari*). So in the furthest east is depicted a huge castle, labelled *Paradixo teresto,* slightly to the north of the pepper-and-spice archipelago (*y^e doue nasse piper e altre/ . . . spezie*), separated by a mountain wall from the three Indias (*India de sora, India de mezo, India de soto*), which follow in a line from east to west without a sign of the Indian peninsula. Fronting these three Indias, in the eastward projection of an Africa which Edrisi might have drawn, we meet with

Imperio de la/ Balsera—in other words, Basra, Balsora, or Bassora—transferred to the wrong continent from the Shatt-al-arab, exactly as in the Andrea Bianco of 1436. To the west of this, enclosed by the upper waters of the Nile, is the realm of Prester John (*Imperio del pr/esto iani*, further defined as *paexe-del-presto/ ianiquesti duo fiu/mi-s'e-insuo li/bertade-de-tegn/ villi-e de lasa/rli-i qualli cun/ duxe aqua/ al chaiero e/in alesandria*). No indications are given us of the discoveries of the Portuguese in West Africa, which had by this time advanced well beyond Cape Verde, except for *Buider* (Bojador, which is really pre-Portuguese), *f. deuoro* (f. dell'-oro, associated with the Catalan voyage of 1346 quite as much as with the Portuguese voyages of 1435, etc.), *gruena* (Guinea). Towards the extreme south, Africa is represented as contracting to a peninsula, and then expanding into a southern continent, where no one could dwell for heat and serpents (*Dixerto dexabitado p. chaldo e p. serpenti*). This unhappy land is coloured scarlet, like the Red sea (*Mar rosso*), presumably to signify the burning heat which one must suffer there. Answering to this, the extreme arctic zone is entitled *dixerto dexabitado per fredo*. Following the common misconception of inferior mediæval maps (long since corrected by the Catalan atlas of 1375), the celestial empire, China, or Cathay (*tenplon chatai*), is thrust up to the far north-east of Asia, and placed on the upper waters of a river which communicates with the Caspian, or Sea of Baku (*Mar do bachu*). The Scandinavian peninsula is also of the thoroughly dark-age pattern; the Danish land projection does not appear at all; and the Baltic has the name of Sea of the Germans (*Mar dalemani*). It is therefore apparent that, apart from the Mediterranean basin, the Spanish lands, and Great Britain (*Ingeltera, Schozia*), this planisphere of 1442 shows very little even of that degree of enlightenment which one might expect in the middle of the fifteenth century, almost seventy years after the Catalan atlas had been draughted, and more than ninety since the execution of the Laurentian portolano of 1351. For obscurantism, indeed, the present work is in places a parallel to (though never as debased as) the Borgian map of 1450. Perhaps its most notable feature is its clear indication of Prester John in East Africa—one of the earliest of such indications)—but without any apparent identification of that potentate with the Negus of Abyssinia. Up to the 1436 mappe-monde of Andrea Bianco, it would be difficult to find any work of European cartographers which placed the Priest-King anywhere but in Asia; and even in Leardo (as in Bianco) the *imperium presto iani* lies in a kind of infinitely extended Somaliland, and fronts India across a sea no broader than the Mediterranean. On the other hand, it must be noticed that the Prester's Realm is not identified with any extension of "India," nor with *Etiopia*, which lies a considerable way to the west of the *paexe del presto*.

C. Raymond Beazley.

Supan's Physiography.

'Grundzüge der Erdkunde.' Von Prof. Dr. Alexander Supan. Dritte, umgearbeitete und verbessert Auflage. Mit 230 Abbildungen in Text und Zwanzig Karten in Farbenbruck. Leipzig: Verlag von Veit & Comp. 1903. Pp. x., 852.

This well-known work is a true physiography, and is divided into six parts: I. The Earth as a Body and the Main Outline of its Surface Conditions; II. The Atmosphere; III. The Ocean; IV. The Dynamics of the Land; V. The Morphology of the Land; VI. The Plant Covering and the Distribution of Animals. In preparing the third edition, Dr. Supan has added some 140 pages to the text, which has been carefully revised throughout. The book is one of the best, if not the best, summary we possess of the present state of our knowledge of phenomena on the surface of the Earth, and its usefulness is much enhanced by the brief references to

literature at the end of each chapter. Dr. Supan, however, does more than merely reproduce the work of others; the treatment of the subject every here and there is distinctly original, while everywhere it is clear and authoritative. The chapters in the section on the Morphology of the Land are among the most valuable, and contain an elaborate and interesting classification and description of forms, which is, perhaps, the least unsatisfactory of the many which have been devised to include all the infinite variety of shapes into which the surface of the Earth has been moulded and carved. The book is one of the indispensable works in a geographer's library.

HISTORICAL GEOGRAPHY.

Ancient Map of Asia Minor.

'Asia Minor.' Ed. by J. G. C. Anderson, M.A. Murray's Handy Classical Maps. Ed. by G. B. Grundy, M.A. London: John Murray. 1903.

Mr. Anderson's repeated visits to various parts of Asia Minor, and his long study of its ancient geography, have given him singular qualifications for revising its ancient map. A great deal of research has gone to the placing of the city names, and where Mr. Anderson is not a first-hand authority (as he is in the north and north-central parts), his identifications, etc., present the latest work of Prof. Ramsay, M. Radet, M. Cumont, and many others. The provincial boundaries, marked boldly in red, are drawn somewhat conventionally, as is inevitable in the absence of exact knowledge of the delimitation lines. For the relief detail Messrs. Bartholomew are responsible, and it is as correct as is to be expected in the case of a country where very few heights have been fixed by any better process than aneroid readings. On the whole, this is the best of Mr. Murray's series that we have seen, and the best existing map of ancient Asia Minor on a handy scale.

D. G. H.

Ancient Greek Geography.

'Geschichte der Wissenschaftlichen Erdkunde der Griechen.' By Hugo Berger. Second Edition, improved and enlarged. Pp. v., 662. Leipzig: Veit & Co. 1903. (A few figures in the text.)

A revised reissue of the best history of ancient geography which exists. The learned author has added a little to the total bulk—not more than some twenty-five pages—but this addition does not represent all that is new; for the introductory chapters, which were required when the work originally appeared in four fascicules have been eliminated in the single volume. A new preface sets forth the main problems which ancient geographers tried to solve, and the index has been greatly enlarged. No student of ancient geography can afford to dispense with this volume.

Arab Descriptions of Egypt.

'Beschreibung Ägyptens im Mittelalter, aus den geog. Werken der Araber.' By Else Reitemeyer. Pp. 238. Leipzig: Seele & Co. 1903.

A book of a popular kind on a subject for which it is hard to believe there is a popular demand. The best known of the Arab writers on Egypt alone are dealt with, and there is no attempt to treat even these exhaustively. For instance, only a very small part of what they say on the provincial towns is repeated, and there is little or no comment on the correctness of their information. The book is, in fact, a sort of delectus, which, to judge from the disproportionate space assigned to the Arab reports of Egyptian antiquities, seems to be intended for the general cultivated public rather than for scholars. It is a grave drawback to the usefulness of the book that it is issued without index, page-headings, or any but the scantiest table of contents.

THE MONTHLY RECORD.

EUROPE.

The Building of the Grampians.—Mr. Peter Macnair, of the Glasgow Museums, has undertaken a rediscussion of the problem of the Grampians, which he defines as the high grounds of Aberdeenshire, Kincardineshire, Forfarshire, Perthshire, and Argyllshire. The complex structure of this area has been variously interpreted, and Mr. Macnair summarizes the salient points in the chief contributions towards its elucidation. His own point of view is that the Grampians are to be regarded as of very complex structure, and, following Lapworth, he considers them to be the basal wreck of such a mountain chain as the Alps, where the complicated fan-shaped structures and complementary troughs have been planed down by denudation so as to simulate simple anticlines and synclines. The chief axes of these fan-shaped structures run along Loch Awe in the north-west, and on the margin of the Highlands from Inch Malcolm west of Bute to Helensburgh; while the intervening structural trough forms the Cowal axis, and extends from near the mouth of Loch Fyne, by the north of Loch Riden to Ben Vorlich. This latter structural trough very nearly coincides with the axis of maximum foliation. The oldest rocks for the author are found along the south-western highland margin, and a succession of younger and younger rocks is found in passing towards the north-west. The movements which folded the rocks are supposed to have acted from it west to south-east, for where bedding can be traced the overfolding is generally to the south-east.—*Proc. R. Phil. Soc. Glasgow*, **xxxiv.** 1902–1903, pp. 147–224, with map and sections.

Electric Railway up Vesuvius.—Messrs. T. Cook and Son have just completed a new electric railway, which starts from Pugliano, near the base of Vesuvius, and connects with the old funicular railway, which for the last twenty-three years has climbed the actual cone of the volcano to the crater. The work has been carried out under the direction of Herr Strub, of Zürich, well known as a specialist in mountain railway engineering.

Bridging of the Volga.—It is stated that it has been definitely decided to construct either a bridge or a tunnel connecting the two banks of the Volga near Kazan. It is estimated that the bridge would cost 3½ million roubles, and the tunnel nearly six million. The Volga is also to be bridged near Saratov.

ASIA.

Captain Rawling's Surveys in Western Tibet.—Writing from Phobrang, in Ladak, on October 4, Captain C. G. Rawling, whose recent expedition into western Tibet was assisted by a grant from our Society, announced the successful conclusion of the undertaking, a total area of 38,000 square miles having been accurately surveyed with the assistance of Babu Ram Singh, a sub-surveyor lent by the Surveyor-General of India. Captain Rawling left Leh, accompanied by Lieut. A. J. G. Hargreaves, in May last, and crossed the frontier by the Lanak La, striking thence due east, in order to extend the survey beyond the part reached by Captain Deasy. After reaching the Arport (Horpo) Tso lake, some difficulties were encountered owing to the desertion of a party of men who were to bring in a supply of grain by yak, and to the loss of eighteen out of twenty-five ponies during a blizzard of eight days. The loss of the grain was, however, made up by the use of a supply buried by Captain Deasy in 1898. The country to the north-east was a barren desert of mountains and salt lakes, with practically no animal life; but to the south-east the level dropped gradually from 16,500 to 15,000 feet, the surface becoming grassy,

and abounding in antelope (*Panthalops Hodgsonii*) and wild yak. This country was frequented by nomad Tibetans, who proved very friendly; but on approaching the gold-diggings of Munok Tok, the further advance towards Rudok was prohibited by an official from Tok Jalung, who, however, showed himself otherwise well disposed. The return to Kashmir was therefore made by a route leading north-west, through a district abounding in gazelle and burrel, to Noh. The most easterly point reached was, according to a sketch-map sent to us by Captain Rawling, in about 83° 45′ E., all the routes being included between the parallels of 33° and 35° 30′. Numerous lakes—some salt, some fresh—were discovered, the name Lake Markham being bestowed on the largest, a partly fresh body of water 70 square miles in extent. Many small streams enter the lakes, but there are no large rivers. Other lakes that formerly existed have now disappeared, leaving dry beds of salt and soda, while all show a diminution in size, owing, Captain Rawling thinks, to a falling off in the amount of snowfall. We hope to receive a fuller account of the journey before long, for publication in the *Journal*. Meanwhile, the extensive cartographical material is being worked up by the Survey of India Department.

The British Expedition into Tibet.—The mission lately entrusted to Colonel F. E. Younghusband, of proceeding to Tibet for the purpose of negotiating with the Tibetan authorities, and, if possible, coming to an arrangement for the encouragement of trade relations with that country, has assumed the shape of a military expedition, by reason of the unfriendly, not to say threatening, attitude assumed by the Tibetans. Colonel Younghusband, who, with Mr. White and other political officers, had reached Kamba Jong in Tibetan territory, has been summoned to Simla for the purpose of conferring with the authorities regarding the composition and plans of the expedition. The command of the forces employed has been given to Colonel Macdonald, and the route chosen is that by the Chumbi valley—the wedge of Tibetan territory which runs down between Sikkim and Bhutan, which, from its favourable climatic conditions, has been a favourite summer resort of the rajas of Sikkim. It is approached from British territory by the Jelep La (14,390 feet), on the route to which is the British post of Gnatong (more properly Natang). Those who wish for the best information on the physical geography and present state of affairs in this borderland between India and Tibet cannot do better than consult Mr. Freshfield's just-published book, 'Round Kangchenjunga,' which has appeared at a most opportune moment. At pp. 59 *et seq.*, Mr. Freshfield gives a succinct sketch of our relations with Sikkim and Tibet from 1817 onwards, the principal events being the interference (in that year) of the East India Company to check the encroachments of Nepal; the cession of the Darjiling district in 1835; the arrest of Dr. Campbell and Sir Joseph Hooker in 1848 by the Sikkim prime minister, and other insults on the part of that state, which ended in the war of 1861, by which our suzerainty was effectively established; the abortive Macaulay mission in 1886; and, lastly, the war of 1888, by which, though the Tibetan forces were thoroughly routed and dispersed, no real advance towards more satisfactory relations between India and Tibet was made. It is to be hoped that present events will once for all settle the long-pending controversy, and establish on a firm footing the wished-for facilities for the extension of British trade with Tibet. Another book which may be read with advantage is Colonel Waddell's 'Among the Himalayas.' It is hardly necessary to add that the best information respecting earlier European relations with Tibet, from the time of the Jesuit and Capuchin missionaries who laboured at Lhasa during the early part of the eighteenth century, to that of the British embassies due to the far-seeing policy of Warren Hastings, and of the one

British visitor to Lhasa—Thomas Manning—is to be found in Sir Clements Markham's well-known book, published in 1876.

American Expedition to Russian Turkestan.—Prof. Raphael Pumpelly, of Newport, R.I., has recently returned from a summer's journey in Turkestan, where he made a reconnaissance, under the auspices of the Carnegie Institution, of the ancient human occupation of the region in relation to its physical geography. The other members of the expedition were Prof. W. M. Davis, of Harvard, Mr. Ellsworth Huntington, Carnegie research assistant, and Mr. R. W. Pumpelly, with Mr. S. de Brovtzine, of St. Petersburg, as interpreter. Mr. Richard Norton, director of the American School of Classical Studies in Rome, was an independent member of the party. From Baku, the great petroleum port on the west coast of the Caspian, the travellers crossed by steamer to Krasnovodsk, May 23, whence the Central Asiatic railway carried them, with many stops and side excursions on the way, to the end of the main line at Tashkent, and to the end of a branch line at Andizhan, June 26. Prof. Pumpelly, with Messrs. Norton and R. W. Pumpelly, then made an excursion south-eastward across the Alai range and valley to Lake Karakul on the northern Pamir, returning *viâ* Andizhan, Baku, and Constantinople, and reaching America on September 4. Prof. Davis and Mr. Huntington went north-east, crossing the western Tian Shan ranges to Lake Issikul, where they separated; Prof. Davis turned northward, and came home *viâ* Semipalatinsk, Omsk, and St. Petersburg; Mr. Huntington went south to Kashgar, and west to Samarkand and Askhabad, where he has lately arrived, and where he will make his winter headquarters, after an excursion into northern Persia.

AFRICA.

Count Wickenburg's Journey from Jibuti to Lamu.—We have already given, from a letter sent to us by the traveller himself, a short account of Count Wickenburg's journey through the Somali and Galla countries from Jibuti to Lamu (*Journal*, vol. xix. p. 216; xx. p. 338). A fuller account of the journey, accompanied by a valuable series of route maps, now appears in *Petermanns Mitteilungen*, Nos. 9 and 10, 1903. It is unnecessary here to do more than refer to the parts of the route which offer the greatest novelty from a cartographical point of view. Like so many of his predecessors, Count Wickenburg's southward march from the Hawash led him down the remarkable chain of lakes which is such an important feature of this part of Africa, but, as in previous cases, while almost all the lakes were touched at, and the shores of some followed for a considerable distance, the results suffer from the defects of all mere route-surveys, and leave many points still in uncertainty. It is much to be wished that some traveller would undertake a thorough survey of these lakes, and not be content merely to touch them in passing during a more extended journey.* For a route survey, Count Wickenburg's appears to have been carried out with great care, being based on a very large number of bearings of mountain peaks, etc., all of which are shown on insets on the separate sheets. His distances were estimated both by means of the pedometer and by the time taken on the march. The map of the lakes shows a good general agreement with those of Harrison and Neumann, at least as regards the parts actually visited, and is in many ways a great improvement on the map given in *La Géographie* for February last, based on the itinerary of M. Dubourg de Bozas. The nomenclature

* The recent survey by Captain Maud, the results of which are being worked up for publication by the Society, will further improve the mapping of this region, but some points are still left uncertain. Captain Maud accompanied Mr. E. A. Butter on his recent expedition, which returned last summer.

of the lakes seems still in a state of confusion. Thus the Hora (lake) Shale of Neumann appears as Hora Abjato, and the Hora Korre to the east, as Lake Kime. On the other hand, the name Shalla is given to the Lamina of Wellby, Harrison, and Neumann, in which respect the Austrian traveller agrees with M. Dubourg. The name Pagade is, perhaps accidentally, applied to the Chamo of Bòttego, who assigned it to the larger lake to the north (Abbai, or Abbaya). Count Wickenburg thinks that these two lakes once formed a single body of water. At the time of his visit, the periodic outflow of the lake towards the Sagan was dry, and he was unable to trace its course downward on account of the narrowness of the gorge through which it passes. On various points shown hypothetically on Count Wickenburg's map, further light will be thrown by the results of Captain Maud's surveys. As regards Lake Stefanie, which had been reported by previous travellers as having almost entirely disappeared, Count Wickenburg shows a considerable extent of water, though a tract to the south, once covered by the lake, is now dry; while the water is so salt as to be undrinkable, and the skeletons of crocodiles, etc., in its neighbourhood show that it no longer supplies the necessary conditions for these. The most novel part of the route was that south of Stefanie to the Rendile country, through districts hitherto quite untraversed. The general character of the country resembles that of the more southern area traversed by Dr. Donaldson Smith, and quite recently by Mr. Tate of the British East Africa Protectorate Service.* It is a vast waterless steppe, mainly volcanic in character, and apparently of recent formation, from which various ridges and peaks rise here and there. In the north Mount Kanjaro, with a height of 6900 feet, is the most prominent peak; while further south a continuous chain of conical hills, rising to some 5000 feet, runs from north-east to south-west for 50 miles. It is known as Huri (clouds) to the Oromo, but as Gagawa to the Rendile. Its flanks afford some pasturage. Still further south the Marsabit range, seen by Dr. Donaldson Smith, has some thick forest. Three well-marked craters occur in the range, the southernmost being apparently the site of the crater-lake of Sogorti, first mentioned by Dr. Smith. Koroli, spoken of by that traveller as a mountain, is in reality the dry bed of an old lake.

Explorations South of Insalah.—Recent French activity in the Central Sahara has added considerably to our knowledge of the geographical features of that region. We have already referred (*Journal*, vol. xxi. p. 322) to Lieut. Cottenest's military expedition against the Hoggar Tuareg, and the reconnaissance of the Muidir plateau carried out by Colonel Laperrine and the officers under his orders. The work of these parties has been extended by a subsequent expedition under Lieut. Guillo Lohain, whose narrative appears in the supplement to the *Bulletin du Com. de l'Afrique Française* for August, September, and October of the present year. While the general direction of the route was very similar to that of Lieut. Cottenest, the sections in which it was actually over the same ground formed but a small part of the whole, and during the march of over 2000 kilometres (1350 miles) many new details were added to the map. Lieut. Lohan made the circuit of the Hoggar *massif* (to which he gives the general designation Kudia), the precipices and gorges of which often proved formidable hindrances to the march with laden camels. He paid attention to the system of weds which run out from the *massif*, and which were in many cases well supplied with water and fringed with abundant vegetation. Those to the east of the plateau run to the south-east, and unite to form the Wed

* We hope shortly to give a detailed account of Mr. Tate's interesting journey, which led to the Rendile country from the south.

Tin-Tarabin. The destination of those to the south could not be proved with certainty, but Lieut. Lohan thinks that they are lost in the Erg to the south and south-west, and that Deporter was mistaken in supposing that they make their way to the Igharghar. The head of the latter seems to be the Wed Tahifek, which rises further north in the Kudia at Mount Ikarhakar, and begins its course by flowing southward. On the return journey a *détour* was made to the west of the Kudia, a visit being paid to the important centre of Tit, situated on the large wed of the same name, and to the small settlement of Abalassa, placed beneath the spur of a range running from north to south, and possessing the best cultivation seen so far during the whole journey. Hence the "reg" was crossed in a northerly direction, the soil being very fine, but well compacted, and traversed by numerous small streams. Lieut. Lohan fully confirms Lieut-Cottenest's statement as to the excellence of the route to the west of the Kudia, which is said to continue good as far as Inazaua, north of Timbuktu. It is the great commercial route of antiquity, which has only been closed of late through the exactions of the Tuareg, now a thing of the past, as the country is under thorough surveillance by the French colonial troops. M. Gautier's visit to this region, to which allusion has already been made in the *Journal*, has likewise elicited some facts of interest, though a full account has not yet been published. In the *Annales de Géographie* for July 15 last, the traveller calls attention to the fact that the "Ahnet," the mountainous district south of Tidikelt, and the watering-place of Inzize on the route to Timbuktu, require to be shifted considerably to the east of their position on our maps, being probably south-east instead of south-west of Insalah. Inzize is a volcanic *massif*, in the centre of which is a tiny crater-lake which gives an unfailing supply of water. M. Gautier also speaks of the numerous rock drawings and inscriptions found in the Muidir plateau, which, though showing certain animals not now occurring in the district, represent as a whole the actual fauna, no drawings occurring of the elephant, rhinoceros, etc., often seen further north. The human figures include both naked foot-passengers and draped camel-riders. Various traces are still observable of the population which existed here before the Moslem invasion.

New Journey of M. de Mathuisieulx in Tripoli.—We lately reviewed the book in which the energetic French traveller, M. de Mathuisieulx, described his journey in 1901 into the interior of Tripoli—the first within recent years by which any decided additions to our knowledge had been made.* The traveller has, during the present year, carried out successfully a still more extended journey, some account of which is given in the supplement to the *Tour du Monde* for August 29 last. From Tripoli he went west along the coast to the site of the ancient fort Sabratha, of importance both in Phœnician and Roman times, the ruins of which he studied carefully. Then turning inland, he crossed the Jefara to the uplands of Jebel Nefusa, at the northern foot of which he came upon the interior Sabratha, now known as Sabria Jebel. In this region he discovered evident traces of the old Roman road from Tacape (Gabes) to Leptis Magna, about which there has been so much discussion, some holding that it passed far to the south through Ghadames, while others placed its course to the north of the Nefusa escarpment. In reality it ran along the northern edge of the uplands. The

* It has been stated in various quarters that no European traveller, except M. de Mathuisieulx, had been permitted to travel in the interior of Tripoli within recent years. This is not quite correct, for Mr. Dodson, it will be remembered, made his way to Murzuk two years ago.

ruins along its course are in an advanced state of decay, as the inhabitants use the stones for building purposes, but M. de Mathuisieulx was able to identify some of the posts indicated by the Antonine Itinerary. After pushing south-west towards Ghadames for some distance, he retraced his steps, and, following the highlands east past Iffren, made a still further advance to the south-east, by Mizda and Ghirza, in the direction of Sokna. The country in this direction is a desolate stony desert, except in the wadis, where numerous traces of farms and forts are to be seen. The wadis Soffedjin, Ghirza, and Orfella were admirably cultivated in ancient times, but the position of the ruins shows that even then crops could only be grown on the lower grounds. The climatic conditions seem deteriorating at the present day, for the Mizda district, a most fertile spot at the time of Barth's visit, is now quite sterile by reason of the cessation of the rainfall. Returning to the coast by a direct route to the north, M. de Mathuisieulx examined the ruins of the ancient port of Kiniphos, the advanced post in this direction, returning to the capital by a route parallel to the coast. In addition to his archæological discoveries, he is said to have collected much material in regard to the geography, zoology, ethnography, etc., of the country. A full report will shortly be made to the Minister of Public Instruction, and will no doubt be published eventually, like that of the former journey, in the *Nouvelles Archives des Missions Scientifiques*. We understand that M. de Mathuisieulx contemplates continuing his explorations next year.

AMERICA.

Dr. Hans Meyer in Ecuador.—Writing on September 12 from on board the *Prince Bismarck*, Prof. Hans Meyer gives, in the seventh number of the Berlin Geographical Society's *Zeitschrift*, a provisional account of an investigation carried out by him in the summer months of this year into the glaciation of the Cordilleras in Ecuador. Accompanied by the artist, R. Reschreiter, he made, in the beginning of June, a circuit of Chimborazo, ascending its east, south, north-west, and north sides into the region of perpetual snow and ice. In a second tour the immense crater of Altar yielded a particularly rich booty of glacial observations. Next, setting out from Latacunga, the travellers, in the face of an exceptionally heavy fall of new snow, covered in nine hours and a half the distance from the snow-line to the edge of the crater of Cotopaxi, found to be 1500 feet deep and 2600 feet wide. There was comparatively little steam rising from the crater. Then, on the north side of Quilindaña, they found old glacial traces suspected by W. Reiss, and others elsewhere. In spite of highly unfavourable weather at Carihuairazo, Prof. Meyer was able to determine the much larger glacial formation once existing there. A tour from Quito to Antisana turned out highly helpful to an understanding of the present and past glaciation of this mighty snow-mountain. Inclement weather frustrated a visit to Cayambe, but an ascent of the western peak of Chimborazo to a height of 20,000 feet was made from the north-west. Prof. Meyer brings home abundant geological and botanical collections, as well as photographs and pencil sketches. The fuller report of his successful expedition will be awaited with interest.

Progress of the Austrian Expedition to Eastern Brazil.—Letters from Dr. Steindachner, giving an account of the progress of his expedition (see *ante*, p. 88) down to June 6 last, are printed in No. 7–8 of the *Mitteilungen* of the Vienna Geographical Society. From Barra do Rio Grande, on the São Francisco, a voyage of fourteen days was made up the Rio Grande and its large and swiftly flowing tributary the Rio Preto, to the small settlement of Santa Rita. This river voyage possessed unusual fascinations for the travellers, and the winding

nature of the streams allowed them frequently to traverse the neighbouring forests on foot between one halting-point and the next. The Rio Grande twice breaks through the mountains in nearly a right angle between Barra and the mouth of the Rio Preto. The latter stream has clear and dark water, which contrasts strongly with the clayey water of the Rio Grande. Its banks are thickly wooded, and characterized by two species of palms, known as Butiri and Butirana—the former said to be a veritable king among Brazilian palms. Several capybaras were captured alive, while the first crocodile was shot on the river, and blue Araras were seen there for the first time. The abundance of mosquitos during the last five days was the only drawback to the delight experienced in the constant observation of fresh novelties. An overland march from Santa Rita brought the travellers to Parnagua, in the basin of the Parnahyba, one of the main objectives of the expedition. Here daily excursions were made by land and water, and the collections increased rapidly. Dr. Steindachner frequently fished in the beautiful lake, some 4 miles long, on the borders of which the small village is placed. At the time of writing, the expedition was about to start overland for S. Filomena, on the upper Parnahyba (a twelve days' ride), and, as one of the members of the party, Dr. Penther, was suffering a good deal from rheumatism, it was thought better that he should return to Europe by the route already traversed.

Peruvian High-altitude Railways.—The line between Oroya, the terminus of the Central railway, and Cerro de Pasco (14,000 feet) will, it is expected, be finished before the end of the present year. The summit level is at the great altitude of 15,680 feet. A short line connecting the Morococha mining district with the Central railway has recently been completed by the Peruvian corporation. It branches off at Ticlio, about 15,500 feet above sea-level, rises some 135 feet higher, and then descends to 14,900 feet.

POLAR REGIONS.

Captain Amundsen's Expedition.—The Dundee whalers which returned from Davis straits in November report that no sign was seen of Captain Amundsen or his vessel at the rendezvous which had been arranged at Dalrymple rock, near Smith sound, where Captains Milne and Adams arrived on June 26. The ice and weather conditions are said to have been very unfavourable this year, and fears have been expressed for the safety of the explorer, owing to the small size of his vessel. It may be pointed out, however, that Captain Amundsen's failure to be at the rendezvous at the appointed time would be due to the unavoidable postponement of his date of sailing. A large quantity of stores was left at Dalrymple rock.

The Danish Expedition to West Greenland.—The Dundee whalers referred to in the preceding note met Mr. Mylius Erichsen and his party (*Journal*, vol. xix. p. 641; vol. xxi. p. 325) in the neighbourhood of Dalrymple rock. The news of the explorers is not reassuring, Count Moltke being at the time very ill, and the whole party living among the Eskimo, in a state of great destitution, on Saunders island. The whalers were unable to convey them to Greenland, but gave them some supplies and wood to build a boat, their own having been abandoned in Melville bay. It is feared that if an attempt was made to leave the island the party would certainly have perished in the terrific weather that followed, but it is hoped that they may have decided to remain for the time being with the Eskimo. It is possible that they may since have fallen in with Captain Amundsen. Some details of the doings of the party during the early part of the year were given in the eighth number of *Petermanns Mitteilungen* for the present year (p. 192). The winter had been spent at Jacobshavn, whence the party started north in sledges during February, reaching Saunders island towards the end of April.

Currents in the Arctic Ocean.—At a recent meeting of the Imperial Russian Geographical Society, Mr. Knipovich read a paper on "The Warm Currents in the European Part of the Arctic Ocean." As is known, a branch of the so-called Gulf Stream divides into two after rounding the North cape. One portion goes along the western coast of Spitsbergen, while the second, taking a course between North Cape and Bear island, penetrates into the comparatively shallow Barents sea. Here, near to the meridian of Kola, it subdivides into four branches, the southern of which is called by Mr. Knipovich the Murman Warm Current. The author observed that these currents had a very regular and permanent direction. The current going to Spitsbergen sends an under-current to the Storfjord, and, continuing its course, also becomes an under-current near the north-western end of Spitsbergen; afterwards turning to the east, it enters the deep basin which Nansen found to exist in the Arctic ocean. These observations are in full accordance with the researches of Admiral Makaroff in the *Yermak* in 1899. Concerning the yearly variation of temperature at various depths, Mr. Knipovich obtained the following results. The penetration of heat from the surface is very slow; for instance, along the Murman coast the water at a depth of 200 or 250 metres reaches its highest yearly temperature three months later than the surface. Especially slow is the penetration of heat in those parts of the sea which are separated from each other by the rise of the sea-bottom, as, for instance, in some parts of the White sea. The beneficial influence of these warm currents is best observed in the distribution of ice in the Murman current. The latter forms a barrier against the advance of ice to the south, owing to which the Murman coast is free from the ice coming from the Arctic ocean.

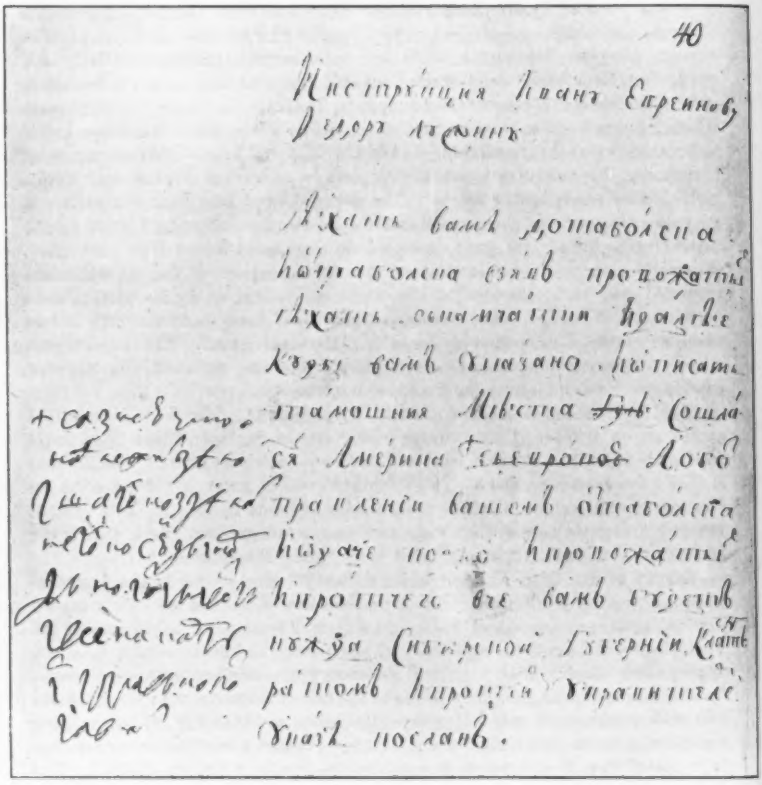
The British and German Antarctic Expeditions.—The *Terra Nova* arrived at Hobart on October 31, the voyage from Aden having been made under most favourable conditions, and completed well under the anticipated time. The *Morning* arrived a few days later, and the two ships will proceed south, if present plans are adhered to, on December 4. The *Gauss* arrived at Punta Delgada, in the Azores, at the end of October, having done some excellent oceanographical work during her cruise in the Atlantic. She is expected home during December.

Safety of Dr. Otto Nordenskiöld's Party.—The arrival of the Argentine gunboat *Uruguay* at Rio Gallegos, with the members of Dr. Nordenskiöld's expedition on board, was announced by telegram from Buenos Aires on November 23. The officers had been found on Louis Philippe Land, and the remaining members on Seymour island. This news will be everywhere received with lively satisfaction, as some anxiety had been felt as to the fate of the party. Dr. Nordenskiöld had made a journey of over 400 miles as far south as 66° in 62° W. long., adding considerably to our knowledge of the region explored by the Belgian expedition. It is stated that the *Antarctic* was crushed by ice on February 12, 1903. The *Uruguay*, sent by the Argentine Government in search of the missing party, was under the command of Commander Irizar, of the Argentine Navy, formerly naval attaché at the Legation in London. Dr. Charcot, who proposed to join in the search, will now devote his energies to scientific research in the Antarctic.

GENERAL.

Peter the Great and Geographical Exploration.—The interest taken by Peter the Great in the preparations for Bering's famous expedition of 1725 and following years is well known, the instructions for the conduct of the expedition having been drawn up by the emperor himself not long before his death. It is less generally known that a similar expedition, for the purpose of elucidating the physical relations existing between Asia and America, was organized as early as

1719, in which year a commission was entrusted by the emperor to the geodesists Evreinov and Lusbin for that object. Through the courtesy of our Honorary Corresponding Member, Baron von den Osten-Sacken, we have been favoured with a photographic facsimile (here reproduced on a somewhat reduced scale) of the instructions given by Peter the Great to the intended explorers before they left St. Petersburg. A special interest attaches to the document by reason of the fact that



PETER THE GREAT'S INSTRUCTIONS FOR A VOYAGE OF DISCOVERY BETWEEN ASIA AND AMERICA, 1719.

corrections and additions were made by the emperor's own hand, being written, as will be seen in the facsimile, on the margin of the paper. Our correspondent gives a French translation of the document, which (as it originally stood) may be rendered in English thus: "You are to proceed to Tobolsk, and from Tobolsk, after procuring guides, to make your way to Kamchatka and beyond, according to the directions which have been given you, making a survey of the localities *where* America meets Europe (*sic*). As concerns your journey to Tobolsk, orders have been given to the Landraths and other rulers of the Siberian province to furnish

you with horses and guides, and everything of which you may stand in need." The emperor has erased the word "where," printed above in italics, and has replaced "Europe" by "Asia," adding the words, "which must be done with great care—not only [as regards] the south and north, but also the east and west, laying everything down exactly on the map." The little that is popularly known of this expedition * arises, no doubt, from its failure to set at rest the disputed question, the furthest point reached being one of the Kurile islands. Some account of it is, however, to be found at p. 36 of K. E. von Baer's monograph, entitled "Peter's des Grossen Verdienste um die Erweiterung der geographischen Kentnisse" (1872), which forms the sixteenth volume of the well-known 'Beiträge zur Kenntniss des Russischen Reichs.' A brief account is also given in Jefferys' translation of Muller's narrative of the Russian voyages (p. 44).

OBITUARY.

The Hon. George Charles Brodrick, LL.B., D.C.L.

It is with much regret that we have to record the death of the Hon. George C. Brodrick, who has been a Fellow of the Society for forty years, and for much of that time a member of the Council and a Vice-President. Mr. Brodrick was the second son of the seventh Viscount Midleton, and was born on May 5, 1831, at Castle Rising, in Norfolk, where his father, who became successively Canon of Wells and Dean of Exeter, was then rector. He was educated at Eton and Balliol College, Oxford, where he had a distinguished career, obtaining a double first-class, as well as the Arnold Historical and English Essay Prizes. He took his degree in 1854, and the next year was elected a Fellow of Merton College. In 1858 he carried off the Law Scholarship at the University of London, where he obtained the degree of LL.B. Mr. Brodrick was called to the bar from Lincoln's Inn in 1859, and for some years practised as a barrister on the Western circuit, but eventually he turned from the law to journalism. He is known to have contributed largely, and for the most part anonymously, to the daily press, mainly the *Times* and leading periodicals. He edited in 1865, in conjunction with the Dean of Ripon, 'The Ecclesiastical Judgments of the Privy Council.' In 1880 a selection of his articles and essays were republished under the title of 'Political Studies,' and in the following year he published a work entitled 'English Land and English Landlords.' His latest contributions to literature are mainly connected with academical history, and include the 'Memorials of Merton College,' and a 'History of the University of Oxford.' Quite recently he published 'Memories and Impressions, 1831–1900.' Mr. Brodrick stood three times for Parliament as a Liberal, but each time he had the misfortune to be unsuccessful. He was elected to the Wardenship of Merton College in February, 1881, in place of the late Dr. Bullock-Marsham, which office he held until the end of the last vacation, when he resigned on account of failing health.

In referring to Mr. Brodrick's death at the meeting of the Society on November 10, the President said: "I cannot begin the business of the evening without a reference to the great loss the Society has sustained in the death of the late Warden of Merton. Mr. George Brodrick was a man so well known in

* No mention, *e.g.*, is made of it either in Coxe's 'Russian Discoveries,' or in Burney's 'North-Eastern Voyages of Discovery,' or by Baron Nordenskiöld in his sketch of Russian northern and eastern discoveries given in the 'Voyage of the Vega.'

journalism, in literature, and in society that it is unnecessary, in offering a tribute to his memory, that we should go beyond his services to ourselves, which have been great, and will be enduring. Mr. Brodrick was our oldest councillor, for his service on our Council began in the days of Sir Roderick Murchison. For thirty-four years he has been on our Council, with brief intervals of rest, and in those intervals we always felt his absence. He took a leading part, from the very first, in all measures connected with geographical education; and I always remember that it was Mr. Brodrick who, in 1879, seconded and supported me in my efforts to establish a system of scientific instruction in this Society, and that for some time we stood alone. Of late years he has worked with me in the representation of our Council on the committee of the Oxford school of geography; his influence did much to establish that school on a solid basis. Mr. Brodrick was cautious, and at the same time judicious in counsel, and his advice was always carefully considered and absolutely impartial. He was inclined to compromise and to conciliation. Thus he helped us over many difficulties, smoothed over rough places, steered us through dangerous channels, and was a powerful influence in maintaining peace and friendly understandings among us. In him I mourn an adviser on whom I could always rely, a friend who never failed in need. He was looking forward, only last week, to more leisure and closer devotion to our interests. But it was ordained otherwise. The Society has indeed sustained a heavy loss. It will be long before we shall again find so wise and trusty a councillor as George Brodrick."

Sir Charles Nicholson, Bart., D.C.L., LL.D.

Sir Charles Nicholson, whose death occurred at the advanced age of ninety-four years, at his residence at Totteridge, on November 8, was one of the oldest members of our Society. He became a Fellow in 1856, and served on its Council from 1863 to 1868 and from 1870 to 1875. He contributed to the *Proceedings*, and frequently took part in the discussions at the evening meetings. The deceased, who was the son of Mr. Charles Nicholson, of London, was educated in Edinburgh, where he graduated as M.D. in 1833. In the following year he became a resident in New South Wales, where he practised as a physician with distinction, and soon identified himself with the social and political interests of the colony. He was one of the original representative members for Port Phillip (now the colony of Victoria), in the first Legislative Assembly established in New South Wales in 1843, and three times held the office of Speaker of that Chamber. He was a powerful helper in organizing the public institutions of the country, and his name was specially connected with the work of the foundation of the University of Sydney, of which he filled the post of Vice-Provost, and subsequently that of Chancellor, from 1854 to 1860. He endowed it with valuable gifts, among them being the fine painted windows which adorn the hall of the University, and a splendid collection of Egyptian antiquities. On the occasion of the jubilee of the University, in September last year, Sir Charles received the following telegram from Sydney:—"Senate and members of Sydney University assembled to celebrate jubilee, recognize the goodness of Providence in prolonging your life to see this day, and thank you for your good wishes and continued interest in the university whose steps you guided with so much sagacity and foresight.—Maclaurin, Chancellor." He received the honour of knighthood in 1852, and was created a baronet in 1859. The honorary degree of D.C.L. was conferred upon him by the University of Oxford, and that of LL.D. by the University of Cambridge. He is the author of various official papers and reports connected with colonial, economic, and educational affairs,

and has also written articles in the *Transactions* of the Royal Society of Literature, of which he was Vice-President, containing an account of exploration in Upper Egypt and at Memphis. He was one of the original founders of the Royal Colonial Institute. In 1865 he married Miss Keightley, and is succeeded in the baronetcy by his son Charles Archibald.

CORRESPONDENCE.

The Survey of the Mustagh Range.

In the November number of this *Journal*, p. 541, Dr. Hunter Workman gives an interesting account of his summer tour to Baltistan, accompanied by his wife, a surveyor, and Swiss guides, following up a few glaciers to their sources. Two remarks in the paper, combined with previous similar notices in their book, 'In the Ice-World of Himalaya,' require from me some explanation, otherwise they would lead the general reader to say how very inaccurately this Indian Survey work was done, and to imagine that the Kashmir survey was badly carried out. Certainly some readers require to be informed as to the conditions under which the survey of this part of the Mustagh range was conducted, and to what extent absolute accuracy was attainable.

I am solely responsible for all the topography of the Shigar river from Skardo to its glacial sources, and am now one of the very few left of the survey party who, under Captain T. G. Montgomerie, R.E., began and carried out the survey of Kashmir territory. In June, 1861, when I received my orders, the whole drainage system of the Shigar river, with its two great branches, the Basha and the Braldo, was mostly *terra incognita*; my plane-table section for that summer's work embraced the whole of it, and a good deal more. The only European travellers who had previously seen the ends of the larger glaciers were Vigne, Dr. Thomson, and one of the Schlagintweits. Adolphe had gone up the Punmah glacier in an attempt to cross the Mustagh pass into Yarkand. The Biafo glacier had been seen; the Baltoro and Hisper were unknown to us of the Survey. The work is geographical reconnaissance, and the amount and accuracy of detail shown depends on the number of points fixed by triangulation, and the character and value of the ground. Beyond a few of the most conspicuous peaks, there were no trigonometrical stations in the area I had to sketch, so that, as a preliminary to that summer's work, I had first to ascend several peaks, of about 1700 feet, near Skardo, to get rays over all the mountain mass on the north. The result of my reconnaissance —it does not profess to be anything more—is to be found on the sheets of the Indian Atlas, Nos. 27 A and 44 A.

Before starting, Captain Montgomerie suggested my taking a 7-inch theodolite, but we decided finally that the topography was the most important, and that waiting at stations taking angles would only be wasting the too short summer in that region. The most important part of topographical maps on an unknown frontier is the laying down of all routes and passes, all villages, with the rivers on which they are situated, and next the run of the main ranges. The details of the higher valleys in their more inaccessible parts, covered with perpetual snow and ice, and never visited by the natives of the country, are of no interest or importance except to the alpine climber. It was impossible, in the time at my disposal, to do more than sketch by eye the heads of glaciers and snow-fields, often at a long distance, from some lofty point when the mountains were clear.

Here I may say that the great aim of the Survey Department and the Quarter-master-Generals in India has been to get maps of the frontier, and no part was so

important as that of the north-west. Political relations even with Kashmir were not as they are to-day; we never knew from year to year, and in 1857 from week to week, whether or no some hitch might occur which would render the carrying on of the survey difficult, or even stop it altogether.

Just then the Maharajah of Kashmir was assisting us, although Runbeer Singh looked less favourably on it than his father, Goolab Singh, did; thus the importance of rapid topographical work at that time. All this is not so apparent to travellers in that country to-day, who are inclined to say, "Why was the work not done better?"

The Hoh Loomba, lately visited by the Bullock Workman alpine party, is a good example of what had to be left unvisited upon its course above the villages of Hoh and Naugmani Tapsa. Dr. Workman writes (p. 541), "As in the case of the Choga Lungma, they found the course of this glacier quite different from that laid down in the Indian Trigonometrical Survey map." I never set foot on the glacier; and from near its snout could only sketch in its general direction, while peaks on the range bordering the Hisper glacier were seen from Busper peak and other points. And I was told that, by a pass at its head, it was possible to get to the Hisper glacier. Had I laboured at what was then useless detail up this comparatively small tributary, I should never have reached Arundu, gone up the Chogo Lungma glacier and the Kero Lungma, fixed the Nushik La, and approximately the position of Hunza Nagar, all much more important topographically at that time.

My reply is similar as regards the Orcho Alchoro glacier, of which Dr. Workman says (p. 544), "This glacier is also wrongly defined on the Survey map." It is, no doubt, a very interesting branch of the Kero Lungma, but very unimportant in its details of branches and icefalls, etc., at the period I was making the first map of this intricate portion of the Himalayas. On my return to Arundu on September 10, I had still before me the Ganto La and the Indus valley down to Rondu to map.

The conditions and objects under which I was working in the summer of 1861 cannot be compared with those of travellers like Mr. and Mrs. Bullock Workman, who spend their summer on a few glaciers only, and look up all their details, with ample leisure to make ascents of peaks and gain record boiling-point observations. Every credit is due to them for undertaking even this laborious work, entailing exposure and discomfort. Perhaps the most important result will be the detailed survey on larger scale which Mr. B. Hewett has made; this cannot fail to be very valuable additional topography to be inserted later on in the early and far less elaborate work, and no one looks forward with more interest to seeing this than I do.

For the information of future travellers seeking pleasure on snow and ice, I must point out there are many portions of the Indian Survey map of this part of the Mustagh range that were never visited, and are very inaccurate in the high ground at the heads of the glaciers. There is plenty of work in exploring them and mapping them, even if only with a prismatic compass, or, better, a handy plane-table. One I might especially mention—the Shingkan Lungma, which joins the river from the Boltoro glacier opposite Burdomul halting-ground. I could not get near it; all my supplies were exhausted. Only the general line of the valley is laid down; the rest is all the roughest eye-sketch. Another fine tour to see what a glacier is like would be to the Punmah and up to the sources of its two great branches, the Nobundi Sobundi and Choktoi glaciers.

H. H. Godwin-Austen,
Lieut.-Colonel.

Nore, Godalming, November 7, 1903.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1903–1904.

First Ordinary Meeting, November 4, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS:—*Lionel Forbes Bridges; Captain Frederick F. Carroll, R.A.M.C.; Cumberland Clark; Lieut. Thomas Sands Cox* (*16th Bengal Lancers*); *Major William Cox* (*Somerset Light Infantry*); *Lieut.-Colonel Charles Merewether Ducat* (*4th Bombay Cavalry*); *Lieut.-Colonel K. M. Foss* (*Indian Army*); *B. O. Ingham; Right Hon. Sir Hugh M. Nelson, P.C., K.C.M.G., D.C.L.; Lieut. G. W. Palmer* (*1st West India Regiment*); *David Richardson.*

The Paper read was:—

"Northern Nigeria." By Brig.-General Sir Frederick D. Lugard, K.C.M.G., C.B., D.S.O.

Second Ordinary Meeting, November 10, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the chair.

ELECTIONS.—*Lieut. Boyd Alexander* (*Rifle Brigade*); *Charles R. Arlen; F. S. H. Baldrey; James Brierley, junr.; George Edmond Bright; Major W. A. Boulnois, R.A.; Lieut. E. L. D. Boyle, R.N.; Lieut. Bernard Arnold B. Butler* (*Royal Field Artillery*); *Sackville W. Caldbeck; Arthur Cecil Chapman; George John Christian; John Gardner Coolidge; Augustus Dutton; Hari Das Das; J. A. Douglas* (*2nd Bengal Lancers*); *Dr. John William Evans; William Francis B. Edwards* (*Lieut. 24th P. Infantry*); *Major J. E. Fowle* (*Bedfordshire Regt.*); *Captain Baron Albert D. Furse; Sir William Edmund Garstin, G.C.M.G.; John R. Griffith; Charles Guttmann; Cecil Jackson Redfern Gardiner, J.P.; Frank Arthur Harris; Joseph Wm. Hayward, M.Sc.; Captain Lewis Egerton Hopkins, R.E.; Alexander Huskie Hicks-Bratt; Henry Heath; Harry Edward Howard; Stephen A. Ionides, B.A.; John Jackson; James John Joicey; Stanley A. Kisch; George Jardine Kidston; Major George Leslie, R.E; Aubrey Le Blond; E. Lang; James Logan; David Lockhart Lorimer; Sub-Lieut. Cuthbert D. Longstaff, R.N.; Gilbert C. Longstaff; Campbell Alexander MacAllum; Surg.-Lieut.-Colonel James Magill, M.D., C.B.; Lieut.-Colonel E. S. May, R.A., C.M.G.; Sidney Allcroft Budgett Meakin; John Herbert Milton; C. E. Bruce-Mitford; Frank Hudson Modder; George McKay Morant; Monsieur le Duc de Morny; Charles Norman Morrison; John R. Mott; Lieut. Murray Muirhead, R.A.; Charles Kenneth Murchison; Charles G. A. Nix; Richard Norton; Captain J. O'Kinealy* (*West African Frontier Force*); *Captain Claud A. Percival* (*Rifle Brigade*); *William Davidge Page; General Sir Arthur Power Palmer, G.C.B., G.C.I.E.; Laurence Pullar, F.R.S.E.; Herbert Richmond Palmer, B.A., LL.B.; George Petrides; James Parke Rawlins; Lieut.-Colonel Sir John Rogers, D.S.O., K.C.M.G.; Robert Ferguson Savage; John Maximilian Schmidl; Major Harry Spencer Scott-Harden* (*Colonial Forces*); *Captain J. D. Sherer, R.A.; Lieut. Alfred Aquila Smith* (*5th Punjab*); *William John Sugden; H. N. Sulivan; Harold William Tyler; Walter Beaupré Townley; Percy Alfred Talbot; Washington B. Vanderlip; Lieut.-Colonel Willoughby Verner; Major C. Wanliss* (*Lancashire Regt.*); *Captain T. M. Wakefield, R.A.; John Nimmo Wardrop; Wm. E. West; Henry White; Robert St. John Willans* (*5th Fusiliers*); *Stephen Wand; Levi Walter Yaggy.*

The Paper read was:—

"North Polar Exploration, 1898–1902." By Commander R. E. Peary, U.S.N.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic Sea. *Deutsch. G. Blätter* **26** (1903): 71–92. **Stavenhagen.**

Das Adriatische Meer. Von W. Stavenhagen.

Alps. **Baedeker.**

The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers. By Karl Baedeker. Tenth Edition. Leipsic: K. Baedeker; London: Dulau & Co. 1903. Size 6½ × 4, pp. xxvi. and 572. *Maps and Plans.* *Price* 10*m.* *Presented by Messrs. Dulau & Co.*

Austria. **Diener, etc.**

Bau und Bild Österreichs. Von Carl Diener, Rudolf Hoernes, Franz E. Suess, und Victor Uhlig. Mit einem vorworte von Eduard Suess. Wien: F. Tempsky; Leipzig: G. Freytag. Size 11 × 7½, pp. xxiv. and 1110. *Maps and Illustrations.* *Price* 65*s.* [To be reviewed.]

Austria—Tyrol. **Haushofer.**

Tirol und Vorarlberg. Von Prof. Max Haushofer. (Land und Leute. Monographien zur Erdkunde, iv.) Bielefeld und Leipzig: Velhagen and Klasing. 1903. Size 10½ × 7, pp. 206. *Map and Illustrations.* *Price* 4*s.*

Belgium. *B.A.R. Belgique* (1903): 484–491. **Vercoullie.**

L'étymologie de Vlaming et Vlaanderen. Par J. Vercoullie.

France—Coasts. **Lenthéric.**

Côtes et Ports Français de la Manche. Par Charles Lenthéric. Paris: Plon Nourrit & Cie., 1903. Size 7½ × 4½, pp. iv. and 318. *Maps.* *Price* 5*s.*

An excellent summary of the physical and economic geography in their relation to the coasts of Northern France history.

France—Guides—Cantal. **Boule and Farges.**

Le Cantal. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Marcellin Boule et Louis Farges. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. 316. *Maps and Illustrations.* *Price* 3*s.* 6*d.*

France—Guides—Lozère. **Cord and Viré.**

La Lozère. Causses et Gorges du Tarn. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Ernest Cord, Gustave Cord, et Armand Viré. Paris: Masson et Cie., 1900. Size 7 × 4½, pp. iv. and 290. *Maps and Illustrations.* *Price* 3*s.* 6*d.*

France—Guides—Savoy. **Le Roux.**

La Haute-Savoie. Guide du Touriste, du Naturaliste, et de l'Archéologue. Par M. Marc Le Roux. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. viii. and 338. *Maps and Illustrations. Price* 3*s.* 6*d.*

France—Guides—Savoy. **Révil and Corcelle.**

La Savoie. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Joseph Révil et Joseph Corcelle. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. vi. and 280. *Maps and Illustrations. Price* 3*s.* 6*d.*

These guides occupy a position that has not been filled by other works of the kind, being especially useful to the educated tourist for the excellent bird's-eye view they give of the general physical geography, history, and archæology of the districts with which they deal. These sections extend to quite half the space alloted to the whole book.

France—Orleans. *Ann. G.* **12** (1903): 307–323. **Blanchard.**

Le Val d'Orleans. Par R. Blanchard. *With Map.*

Germany. *Abh. K.P.A.W. Berlin* (1902): 1–132. **Branco.**

Das vulcanische Vorries und Seine Beziehungen zum vulcanischen Riese bei Nördlingen. Von W. Branco. *With Map.*

Germany. **Schulz.**

Die halophilen Phanerogamen Mitteldeutschlands. Von Dr. August Schutz. Sonderabdruck aus der "Zeitschrift für Naturwissenschaften," Bd. 75. Stuttgart: E. Schweizerbart'sche Verlagshandlung (E. Nägele), 1903. Size 9 × 6, pp. 257–293. *Map.*

Germany—Eichsfeld. *M.V. Erdk. Halle* (1903): 77–127. **Nehmer.**

Beiträge zur Landeskunde des Eichsfeldes. Von Dr. A. Nehmer. *With Maps and Profiles.*

Germany—Harz Mountains. *M.V. Erdk. Halle* (1903): 56–62. **Luedecke.**

Ueber die gleiche geognostische Beschaffenheit von Brocken und Kiffhäuser. Von Prof. Dr. O. Luedecke.

Germany—Historical. **Knüll.**

Historische Geographie Deutschlands im Mittelalter. Von Dr. Bolo Knüll. Breslau: F. Hart, 1903. Size 9½ × 6½, pp. viii. and 240. *Price* 4*s.* *Presented by the Publisher.*

In this instructive monograph the author discusses in turn the changes in the natural features (coasts, etc.), the movements of population, forms of settlement, roads and waterways, changes in the fauna and flora, etc.

Germany—Lakes. *M.V. Erdk. Halle* (1903): 74–77. **Halbfass.**

Ueber Einsturzbecken am Südrand des Harzes. Von Prof. Dr. W. Halbfass. *With Maps.*

Germany—Rhine-Hessen. **Schopp.**

Beiträge zur Kenntnis der diluvialen Flussschotter im westlichen Rheinhessen. Von Prof. Dr. H. Schopp. Size 10 × 8½, pp. 10. *Map. Presented by the Author.*

Germany—Thuringia. **Scobel.**

Thuringen. Von A. Scobel. (Land und Leute. Monographien zur Erdkunde, i.) Zweite Auflage. Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 160. *Maps and Illustrations. Price* 4*s.*

Italy—Venice. **Zwiedineck-Südenhorst.**

Venedig als Weltmacht und Weltstadt. Von Hans v. Zwiedineck-Südenhorst. (Monographien zur Weltgeschichte, viii.) Bielefeld und Leipzig: Velhagen & Klasing, 1899. Size 10½ × 7, pp. 208. *Plates and Illustrations. Price* 4*s.*

Russia. *B. Comité Géolog. St. Petersbourg* **21** (1902): 641–651. **Derjavin.**

Observations géologiques dans la partie sud-occidentale de la Russie d'Europe. Par A. Derjavin. [In Russian.]

United Kingdom—London. **Ordish.**

Annual Record of the London Topographical Society. 1900. Including the Reports of the first three Annual Meetings of the Society. Edited by T. Fairman Ordish. London, 1901. Size 9 × 5½, pp. xii. and 114. *Illustrations. Presented by the London Topographical Society.*

The illustrations give a good idea of the neighbourhood of the Strand in former days.

United Kingdom—Rainfall. **Wallis and Mill.**

British Rainfall, 1902. On the Distribution of Rain over the British Isles, during the year 1902, as observed at about 3500 stations in Great Britain and Ireland, with articles upon various branches of rainfall work. Compiled by H. Sowerby Wallis and Hugh Robert Mill. London: E. Stanford, 1903. Size 8¼ × 5½, pp. 250. *Diagrams and Illustration. Price* 10*s*. *Presented by the Compilers.*

The first article discusses the rainfall observations at Camden Square for the past forty-five years, the mean monthly distribution being shown by a diagram. October comes out as distinctly the wettest month, the curve rising fairly evenly from a minimum in March, and falling again with equal regularity.

United Kingdom—Scotland. *T. Edinburgh Geolog. S.* 8 (1903): 194–196. **Cadell.**

Note on the buried River-channel of the Almond. By H. M. Cadell.

United Kingdom—Tide Tables. **Harris and Havergal.**

Tide Tables for the British and Irish Ports, for the year 1904: also the Times and Heights of High Water at Full and Change for the principal places on the Globe. By Captain H. R. Harris and Commander A. Havergal. London: J. D. Potter. Size 10 × 6½, pp. xi. and 262. *Price* 2*s*.

United Kingdom—Wales. **Bradley.**

Highways and Byways in South Wales. By A. G. Bradley. London: Macmillan & Co., 1903. Size 8 × 5½, pp. xii. and 418. *Map and Illustrations. Price* 6*s*. *Presented by the Publishers.*

This volume quite sustains the reputation of the series for readableness and tasteful appearance.

ASIA.

Asia—Commerce. **Bray.**

La Belgique et le Marché Asiatique. Par A. J. de Bray. Bruxelles: Imp. Pollewnis & Centerick, 1903. Size 9½ × 6½, pp. xii. and 384. *Maps and Diagrams. Presented by the Author.*

The scope of this work is wider than its title might suggest. It really deals with modern conditions of trade in Asia as carried on by the principal commercial nations of Europe. A separate section is devoted to each of the European spheres and native states, a comparative view being given of the commercial position, in each, of the several nations.

Central Asia. **Hedin.**

Central Asia and Tibet: Towards the Holy City of Lassa. By Sven Hedin. 2 vols. London: Hurst & Blackett, 1903. Size 10 × 7, pp. (vol. i.) xviii. and 608: (vol. ii.) xiv. and 664. *Maps and Illustrations. Price* 42*s*. *net. Presented by the Author.*

China. **Parker.**

China Past and Present. By Edward Harper Parker. London: Chapman and Hall, 1903. Size 9 × 5½, pp. xii. and 424. *Map. Price* 10*s*. 6*d*. *net. Presented by the Publishers.*

A series of sketches on Chinese history and manners, as well as on European relations with the Chinese Empire. Most are reprinted from magazines and other publications, but in many cases the matter has been extensively revised and re-cast to bring it up to date. Like Mr. Parker's other works, the book contains a good deal that merits attention.

China—Ethnology. *J. Anthrop. I.* 33 (1903): 96–107. **Henry.**

The Lolos and other tribes of Western China. By A. Henry. *With Plates.*

China—Historical. **Tschepe.**

Variétés Sinologiques No. 22. Histoire du Royaume de Tch'ou (1122–223 av. J.C.) Par le P. Albert Tschepe. Chang-Hai, 1903. Size 10 × 6½, pp. ii. and 402. *Map. Price* $5.

One of a valuable series of memoirs published by the French Jesuits at Shanghai.

China—Manchuria. *Kolon. Z.* 4 (1903): 261–264. **Corbach.**

Dalni, Russlands wirtschaftspolitischer Stützpunkt in der Mandschurei. Von E. Corbach.

China—Nankin. **Gaillard.**

Variétés Sinologiques No. 23. Nankin d'alors et d'aujourd'hui. Aperçu Historique

et Géographique par le P. Louis Gaillard. Chang-Hai, 1903. Size 10 × 6½, pp. vi. and 350. *Illustrations, etc. Price* 18*s.*

China—Shantung. *Beiträge Kolonialpolitik* **5** (1903–1904): 10–17. **Maercker.**

Die hauptsächlichsten Ausfuhrartikel Schantungs. Von Hauptmann Maercker.

China—Trade.

China. Imperial Maritime Customs. 1.—Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1902. Part i.—Report on the Trade of China, and Abstract of Statistics. Shanghai: Kelly & Walsh; London: P. S. King & Son. 1903. Size 11 × 9, pp. 34.

China—Wei-Hai-Wei. **Bruce-Mitford.**

The Territory of Wei-Hai-Wei, a descriptive Guide and Handbook, with Maps and Illustrations, a Historical Note and Appendix. By C. E. Bruce-Mitford. Shanghai: Kelly & Walsh, [1902]. Size 7½ × 5, pp. 52.

This little book will do much to make the territory of Wei-hai-Wei better known to the British public.

China—Yangtse. *B.S.G. Com. Paris* **25** (1903): 373–381. **Hourst.**

Mission Hourst Sur le fleuve Bleu. Premier voyaye d'une canonnière française sur le Yang-tseu et ses rapides. Par M. le lieutenant Hourst.

See note in the Monthly Record for August (p. 211).

Chinese Empire—Tibet. **Launay.**

Société des Missions-Étrangères. Histoire de la Mission du Thibet. Par Adrien Launay. 2 vols. Lille & Paris: Desclée, de Brouwer & Cie., [N.D.]. Size 10 × 6½, pp. (vol. i.) viii. and 470; (vol. ii.) 440. *Map and Plates. Price* 12*s.*

French Indo-China. *Nouv. Archives Miss. Sci. et Lit.* **10** (1903): 145–166. **Barthélemy.**

Rapport sur une mission scientifique en Annam et au Laos (région de Xieng-Khouang). Par M. le comte de Barthélemy. *With Map.*

French Indo-China. *B.S.G. Com. Paris* **25** (1903): 329–363. **Lubanski.**

L'Indo-Chine française en 1902. Par M. le lieutenant-colonel Lubanski.

French Indo-China. *Rev. G.* **53** (1903): 54–68. **Mury.**

L'épopée Pavie. Trente années a travers l'Indo-Chine et le Siam. Par F. Mury.

India—Bengal. *J. Asiatic S. Bengal* **72** Pt. II. (1903): 24–56. **Little.**

On two remarkable rain-bursts in Bengal; and some of the more prominent features of the monsoon season in Northern India in 1902. By C. Little.

India—Botany. **Duthie.**

Flora of the Upper Gangetic Plain, and of the adjacent Siwalik and Sub-Himalayan Tracts. By J. F. Duthie. Vol. i. Part i. Ranunculaceæ to Cornaceæ. Calcutta: Office of the Superintendent of Government Printing, India, 1903. Size 7 × 5½, pp. xviii. and 404. *Map. Presented by the Indian Government.*

India—Bundelkhand. *J. Asiatic S. Bengal* **71** Pt. 1 (1902): 99–135. **Silberrad.**

A Contribution to the History of Western Bundelkhand. By C. A. Silberrad.

India—Historical. *J. United Service I. India* **32** (1903): 207–243. **Burton.**

Invasions of India. By Major R. G. Burton. *With Maps and Portraits.*

India—Nepal. *J. Asiatic S. Bengal* **72** Pt. 1 (1903): 1–32. **Bendall.**

The History of Nepal and surrounding Kingdoms (1000-1600 A.D.). Compiled chiefly from MSS. lately discovered. By Prof. C. Bendall. Written as an Historical Introduction to Pandit Haraprasād S'āstri's Catalogue of the Nepal Durbar Library. With chronological Tables and a Plate.

India—Surveys. **Gore.**

Extracts from Narrative Reports of the Survey of India for the season 1900–1901. Prepared under the direction of Colonel St. G. C. Gore, C.S.I. Calcutta, 1903. Size 13½ × 8½, pp. 68. *Presented by the Surveyor-General of India.*

India—Surveys.

Extracts from Narrative Reports of the Survey of India for the Season 1900–1901. Prepared under the direction of Col. St. G. C. Gore. Calcutta, 1903. Size 13 × 8½, pp. 68. *Price* 2*s.* 3*d. Presented by the Surveyor-General of India.*

This will be specially noticed.

Malay States. **Treacher.**

Federated Malay States. Annual Report for 1902. By W. H. Treacher. Kuala Lumpur, 1903. Size 13½ × 8½, pp. 26. *Diagrams.*

Persia. **Sykes.**

Trade of Kerman Consular District for the year 1902-03. Foreign Office, Annual No. 3032. Size 10 × 6½, pp. 8. *Price* ½*d.*

Philippine Islands. *B. American G.S.* **35** (1903): 253-260. **Tower.**

The Climate of the Philippines. By W. S. Tower.

Russia—Siberia. **Bogoraz.**

Publ. Musée d'Anthrop., etc., A. Imp. Sci. St.-Pétersbourg **2** (1901): pp. 68.

Aperçu sur l'Ethnographie des Tchouktches d'après les collections de N. L. Gondatti du Musée Ethnographique de l'Académie Impériale des Sciences de S.-Pétersbourg. Par W. H. Bogoraz. [In Russian.] *With Plates.*

Russian—Central Asia. **Meakin.**

In Russian Turkestan. A Garden of Asia and its People. By Annette M. B. Meakin. London: George Allen, 1903. Size 7½ × 5, pp. xviii. and 316. *Map and Illustrations. Price 7s. 6d. net. Presented by the Author.*

Russian Central Asia—Lake Aral. *Petermanns M.* **49** (1903): 126-127. **Friederichsen.**

Der Aral-See nach L. Berg's Forschungen. Von Dr. M. Friederichsen. *Map.*

Cf. note and map in the *Journal* for April, 1902.

Turkey—Asia Minor. *Petermanns M.* **49** (1903): 130-134. **Fitzner.**

Erdbebenbeobachtungen in Kleinasien. Von Dr. R. Fitzner.

AFRICA.

Abyssinia—Historical. *Rendiconti R.A. Lincei* **12** (1903): 177-201, 239-262. **Rossini.**

Gli atti di Abbā Yonās. Nota di Conti Rossini Carlo.

The "Acts of Yonas" are contained in an eighteenth-century manuscript, preserved in an Abyssinian church. The only copy known in Europe, now in the British Museum, is of later date. Portions of the text are here reproduced, with notes and translations.

Algeria. *Le Globe, B.S.G. Genève* **42** (1903): 114-118. **Chaix.**

Souvenirs d'une excursion à bicyclette dans le désert au Sud de Biskra. Par Prof. E. Chaix.

Algeria. *Nouv. Archives Miss. Sci. et Lit.* **10** (1903): 1-143. **Gsell.**

Enquête administrative sur les travaux hydrauliques anciens en Algérie. Par S. Gsell. *With Maps.*

Algeria—Biskra. **Tripp.**

Beautiful Biskra, "The Queen of the Desert." By C. Howard Tripp. Derby, London, and Watford: Bemrose & Sons, 1903. Size 8 × 6, pp. 94. *Map and Illustrations. Price 1s. net. Presented by the Publishers.*

Account of a winter visit.

Algeria—Bona. **Fenick.**

Important Handbook for Travellers, Yachtsmen, and Officers of the Royal Navy in Bona and neighbourhood. By Frank X. Fenick. Liverpool: Rockliff Bros., Ltd., Printers, 1902. Size 5 × 3, pp. 46. *Map, Chart, and Illustrations.*

Algeria—Rainfall. *Ann. G.* **12** (1903): 324-338. **Gauckler.**

La Pluie à Alger. Par P. Gauckler. *With Diagrams.*

Algerian Sahara. *Ann. G.* **12** (1903): 363-365. **Gautier.**

Lettre sur le Mouydir et l'Ahnet. Par É. F. Gautier.

See note in the Monthly Record, *ante*, p. 700.

British Central Africa. **Pearce.**

Africa, No. 13 (1903). Report on the Trade and General Conditions of the British Central Africa Protectorate for the year 1902-1903. By Major F. B. Pearce, Acting Commissioner. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. 96. *Map and Diagram. Price 1s. 3d.*

Will be noticed in the Monthly Record.

British East Africa—Uganda Railway.

Africa. No. 12 (1903). Report by the Mombasa-Victoria (Uganda) Railway Committee on the Progress of the Works and Revenue working, 1902-1903. London: Eyre & Spottiswoode, 1903. Size 13 × 8½, pp. 22. *Maps. Price* 1s. 1d.

Canary Islands. *B.R.S.G. Madrid* **44** (1902): 639-643. **González.**

Reflexiones acerca del origen del suelo canario. Par J. M. González.

Central Sudan. *Rev. G.* **53** (1903): 4-13. **Destenave.**

Deux années de commandement dans la région du Tchad. Par Lieut.-Colonel Destenave.

Central Sudan. *Ann. G.* **12** (1903): 339-356. **Destenave and Dubois.**

Bas Chari, rive Sud du Tchad et Bahr el Ghazal, avec une introduction de Lieutenant-Colonel G. Destenave, et une carte. Par le Capitaine R. Dubois.

Central Africa. **Johnson.**

Sport on the Blue Nile; or, Six Months of a Sportsman's Life in Central Africa. By Isaac Charles Johnson, junr. London: R. Banks & Son, 1903. Size 9 × 5½, pp. 256. *Illustrations. Price* 7*s.* 6*d. net. Presented by the Publishers.*

This is almost entirely devoted to sporting adventures, though some of the photographs give a fair idea of the nature of the country traversed.

Sokotra and Abd-el-Kuri. **Forbes.**

The Natural History of Sokotra and Abd-el-Kuri. Being the Report upon the Results of the Conjoint Expedition to these Islands in 1898-9. By Mr. W. R. Ogilvie-Grant, of the British Museum, and Dr. H. O. Forbes, of the Liverpool Museums, together with information from other available sources, forming a Monograph of the Islands. Edited by H. O. Forbes. Liverpool: Free Public Museums, and H. Young & Sons, 1903. Size 10 × 6, pp. xlviii. and 598. *Map, Plates, and Illustrations. Presented by the Editor.*

This finely got-up work reflects great credit on the Liverpool Museums, as a special volume of whose *Bulletin* it appears. Although mainly dealing with systematic zoology and botany, the narrative of the expedition contains much that is valuable from a geographical point of view.

Somali Language. **Kirk.**

Notes on the Somali Language, with examples of Phrases and Conversational Sentences. By J. W. C. Kirk. London: H. Frowde, 1903. Size 6 × 4, pp. xii. and 84. *Presented by Sir John Kirk.*

This should be most useful to officers and others whose duties take them to Somaliland. It consists of words and phrases noted down by the author during the recent military operations, with a brief sketch of the main rules of syntax.

South Africa. *Nineteenth Century* **54** (1903): 391-403. **Brabant.**

The Resources of South Africa. By General Sir E. Brabant, K.C.B.

Tripoli. *L'Esploraz. Com.* **18** (1903): 210-215. **Mamoli.**

In Tripolitania. P. Mamoli.

West Africa. *B. Comité l'Afrique Française* **13** (1903): 251-256. **Delafosse.**

La délimitation de la frontière entre la Côte d'Ivoire et le 2e territoire militaire et la Côte d'Or anglaise. Par Maurice Delafosse. *With Map.*

West Africa—Bornu. *Deutsch. Kolonialzeitung* **20** (1903): 300-301. ———

Niger-Benuë-Tschadsee-Expedition. Reise nach Bornu. *With Map.*

See note in the Monthly Record for November (p. 568).

White Nile. *J. African S.* **2** (1903): 375-379. **Stanton.**

The Great Marshes of the White Nile. By Lieut.-Col. E. A. Stanton. *With Map.*

NORTH AMERICA.

Canada. *J. Geology* **11** (1903): 239-282. **Adams.**

The Monteregian Hills—a Canadian Petrographical Province. By F. D. Adams. *With Maps and Illustrations.*

Canada. ———

Geological Survey of Canada. Annual Report. (New Series.) Volume xii. Reports A, B, C, G, I, J, M, O, R, S. 1899. Ottawa: S. E. Dawson, 1902.

Size 9½ × 6½, pp. xvi. 224, 48, 36, 78, 92, 144, 42, 84, 64, 144, and xxiv. *Maps and Illustrations. Price* 80 *cents. Presented by the Geological Survey of Canada.*

Among the more important reports—in addition to the general report on the work of the survey—are those by Mr. Gwillim on the Atlin mining district of British Columbia, and by Mr. J. M. Bell on the region of the Great Bear and Great Slave lake districts (cf. *Journal*, vol. xviii. p. 249). A map of the Klondike goldfields is given.

Canada—British Columbia. **Ridley.**

Snapshots from the North Pacific. Letters written by Bishop Ridley, of Caledonia. Edited by Alice J. Janvrin. London: Church Missionary Society, 1903. Size 7½ × 5, pp. viii. and 192. *Map and Illustrations. Price* 1*s.* 6*d. net. Presented by the Publishers.*

Sketches of travel and mission work in the outlying districts of British Columbia.

Canada—Rocky Mountains. *Alpine J.* **21** (1903): 464–475. **Outram.**

The First Ascent of Mount Bryce. By Rev. J. Outram. *With Illustrations.*

United States. **Atkinson.**

Sheep upon the Upland Cotton Fields, and some other matters. An address . . . by Edward Atkinson. Boston, 1903. Size 9 × 6, pp. 32. *Presented by the Author.*

United States—California. **Anderson and Grinnell.**

P.A. Nat. Sci. Philadelphia **55** (1903): 4–15.

Birds of the Siskiyou Mountains, California: a Problem in Distribution. By M. P. Anderson and J. Grinnell.

United States—Klamath Mountains. **Diller.**

B. United States Geolog. Surv., No. 196 (1902): pp. 70.

Topographic Development of the Klamath Mountains. By J. S. Diller. *With Map and Illustrations.*

United States—Maryland. **Sioussat.**

Economics and Politics in Maryland, 1720–1750, and the Public Services of Daniel Dulany the Elder. By St. George Leakin Sioussat, PH.D. (Johns Hopkins University Studies, Series xxi. Nos. 6–7.) Baltimore, 1903. Size 10 × 6, pp. 84.

United States—Minerals. **Day.**

Department of the Interior. United States Geological Survey. Mineral Resources of the United States. Calendar year, 1901. By David T. Day. Washington, 1902. Size 9 × 6, pp. 996. *Presented by the U.S. Geological Survey.*

United States—Missouri. *Meteorolog. Z.* **20** (1903): 307–314. **Drapczynski.**

Ueber die Verteilung der meteorologischen Elemente in der Umgebung der Barometer-Minima und -Maxima zu St. Louis in Missouri, Vereinigte Staaten von Nordamerika. Von Dr. V. Drapczynski.

United States—Place-names. **Gannett.**

B. United States Geolog. Surv., No. 197 (1902): pp. 280.

The origin of certain place-names in the United States. By H. Gannett.

United States and Cuba.

Monthly B. Int. Bureau American Rep. **15** (1903): 67–70.

Treaties between the United States and Cuba.

CENTRAL AND SOUTH AMERICA.

Brazil. *B.S.G. Com. Paris* **25** (1903): 382–392. **Le Cointe.**

La forêt amazonienne. Par Paul Le Cointe.

The author tries to correct popular ideas as to the nature of the Amazonian forest.

Brazil and Central America. **Poisson.**

Nouv. Archives Miss. Sci. et Lit. **10** (1903): 279–307.

Rapport sur une mission scientifique au Brésil, aux Antilles et au Costa-Rica. Par E. Poisson.

The mission was undertaken for the study of the caoutchouc-yielding and other economic plants of the countries visited.

Brazil—Meteorology. *Sitzb. K.A.W. Wien* **111** (Abth. IIa.) (1902): 615–683. **Hann.**

Zur Meteorologie des Äquators. Nach den Beobachtungen am Museum Goeldi in Pará. Von J. Hann.

Dutch Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **20** (1903): 737–740. **Hasselt.**
Goninie-expeditie. Door J. H. van Hasselt.

This expedition, which has been organized during the summer of 1903, is under the command of Lieut. A. F. Herderschee.

French Guiana. *B.S.G. Com. Paris* **25** (1903): 407–415. **Hesse.**
La Guyane française au point de vue économique. Par G. Hesse.

Mexico—Tabasco. *B.R.S.G. Madrid* **45** (1903): 7–106. **Uncilla.**
Tabasco en la época precolombiana. Por S. Doporto y Uncilla.

Peru. *J. Manchester G.S.* **18** (1902): 153–162. **Portillo and Guillaume.**
The Peruvian Amazonian Basin, with its Prospects for Commerce and Colonization. Translated from Notes by Col. Pedro Portillo by Mons. H. Guillaume. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea—British. *J. Anthrop. I.* **33** (1903): 108–124. **Chalmers.**
Notes on the Bugilai, British New Guinea. By the late Rev. James Chalmers.
A Vocabulary of the Bugi Language, British New Guinea. By the same.
Notes on the Natives of Kiwai Island, Fly River, British New Guinea. By the same.

New Guinea—British. *J. Anthrop. I.* **33** (1903): 125–134. **Holmes.**
Notes on the Elema Tribes of the Papuan Gulf. By the Rev. J. H. Holmes.

New Guinea—Dutch. ——
Tijds. K. Ned. Aard. Genoots. Amsterdam **20** (1903): 719–728.
Nieuw-Guinea expeditie. *With Map.*

New Zealand—Alps. *Alpine J.* **21** (1903): 475–479. **Macdonald.**
A Month's Holiday in the Mount Cook District, New Zealand. By C. A. Macdonald. *With Illustrations.*

Queensland—Almanac. **Slater.**
Slater's Queensland Almanac, Directory, and Gazetteer for 1903. Brisbane: Gordon & Gotch. Size 9 × 5½, pp. xii. and 220. *Price* 1*s.*

Tasmania. *Papers and P.R.S. Tasmania* (1902): 138–142. **Legge.**
Contribution to the Physiography of Tasmania. By Colonel W. V. Legge. *With Plate.*

Tasmania—Astronomy. *Papers and P.R.S. Tasmania* (1902): 85–94. **McAulay.**
Practical Astronomy in Tasmania, and a proposal for a school thereof. By Prof. A. McAulay.

Tasmania—Timber. *Papers and P.R.S. Tasmania* (1902): 35–76. **Green.**
The Timber Industry. By A. O. Green. *With Illustrations.*

Western Australia. **Campbell.**
Notes on the Auriferous Reefs of Cue and Day Dawn. By W. D. Campbell. (Western Australia, Geological Survey, Bulletin No. 7.) Perth, 1903. Size 8½ × 5½, pp. 38. *Map (separate). Presented by the Geological Survey, W. Australia.*

Western Australia. **Fraser.**
Seventh Census of Western Australia, taken for the Night of March 31, 1901. Compiled under the direction of Malcolm A. C. Fraser. Volume ii. Detailed Tables. Perth, 1903. Size 13 × 8½. *Diagram. Presented by the Superintendent of the Census.*

POLAR REGIONS.

Antarctic. **Balch.**
Antarctica. By E. S. Balch. Philadelphia: Allen, Lane, & Scott, 1902. Size 11 × 7, pp. 230. *Maps. Presented by the Author.*
See review in vol. xxi. p. 525.

Antarctic. **Drygalski and others.**
Die Deutsche Südpolar-Expedition auf dem Schiff "Gauss" unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten seit der Abfahrt von Kerguelen bis zur Rückkehr nach Kapstadt, 31. Januar 1902 bis 9. June 1903,

und die Tätigkeit auf der Kerguelen-Station vom 1. April 1902 bis 1. April 1903 mit Beitragen von Bidlingmaier, v. Drygalski, Gazert, Luyken, Ott, Philippi, Ruser, Stehr, Vahsel, Vanhöffen. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin, Heft 5, Oktober 1903.) Berlin: E. S. Mittler & Sohn. Size 10 × 7, pp. iv. and 182. *Maps.*

Antarctic—Meteorology. **Arctowski.**

Henryk Arctowski. Le Pole de froid. (Extrait du No. 6 [1903] du *Bulletin de la Société Belge d'Astronomie.*) Bruxelles. Size 9½ × 6½, pp. 6.

Discusses the observations of the British Expedition.

Antarctic—Swedish Expedition. *Ymer* **23** (1903): 200–208. **Nathorst.**

Den svenska antarktiska undsättnings-expeditionen. Af A. G. Nathorst.

Arctic Ocean. **Varnek.**

A. T. Varnek. Short sketch of the work of the Hydrographical Expedition in the Arctic Ocean, in 1902. [In Russian.] St. Petersburg, 1903. Size 10 × 7, pp. 36. *Map.*

Will be noticed in the Monthly Record.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Anthropology—Catalogue.

International Catalogue of Scientific Literature. First Annual Issue. P. Physical Anthropology. Published for the International Council by the Royal Society of London. London: Harrison & Sons, 1903. Size 8½ × 5½, pp. xiv. and 224. *Price* 10*s.* 6*d.*

Coral Reefs. *American J. Sci.* **16** (1903): 203–213. **Gardiner.**

The Origin of Coral Reefs as shown by the Maldives. By J. S. Gardiner.

Geology. **Geikie.**

Text-Book of Geology. By S. Archibald Geikie. 4th Edition, Revised and Enlarged. 2 vols. London & New York: Macmillan & Co., 1903. Size 9½ × 6, pp. xxii., x., and 1472. *Illustrations. Price* 30*s. net. Presented by the Publishers.*

The new matter added in this edition amounts to 300 pages, bringing the total to over 1400.

Geology. *Geolog. Mag.* **10** (1903): 433–450. **Watts.**

The Functions of Geology in Education and Practical Life. By Prof. W. W. Watts.

Glaciers. *J. Geology* **11** (1903): 285–288. **Reid.**

The Variation of Glaciers. VIII. By H. F. Reid.

A summary of the Sixth Annual Report of the International Committee on glaciers.

Meteorology. *Symons's Meteorolog. Mag.* **38** (1903): 139–141. **Aldridge.**

Curves of Monthly Mean Temperatures for Verkhoyansk (Siberia), the Sonnblick (Austrian Alps), Ben Nevis, Ross, and the Scilly Isles. By E. G. Aldridge. *With Diagram.*

Seismology. *B.S. Belge Géologie* **17** (1903): 11–37. **Van den Broeck.**

Nouvelle théorie de l'explosion volcanique basée sur la combinaison des vues de M. O. van Ertborn avec les expériences et thèses de MM. A. Gautier et A. Brun et avec la théorie de M. A. Stübel. Par E. Van den Broeck.

Tides. *Nature* **68** (1903): 322. **Chapman.**

A Simple Form of Tide Predictor. By R. W. Chapman. *With Illustrations.*

Zoology. **Theobald.**

British Museum (Natural History). First Report on Economic Zoology. By Fred. V. Theobald. London, 1903. Size 10 × 6, pp. xxxiv. and 192. *Illustrations. Presented by the Trustees, British Museum.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography—Coal. *J.R. Statistical S.* **66** (1903): 439–533. **Thomas.**

The Growth and Direction of Our Foreign Trade in Coal during the last Half Century. By D. A. Thomas, M.P. *With Map and Diagram.*

Anthropogeography. **Woltmann.**

Politische Anthropologie. Eine Untersuchung über den Einfluss der Descendenztheorie auf die Lehre von der politischen Entwicklung der Völker. Von Ludwig Woltmann. Leipzig, 1903. Size 10½ × 7, pp. iv. and 326. *Price* 6*s.*

Discusses the influence of race, etc., on political evolution.

Historical—Juan de Garay. **Outes.**

Félix F. Outes. Don Juan de Garay, circumstancias que rodearon su muerte. Estudio histórico-geográfico. Buenos Aires, 1903. Size 10½ × 6½, pp. 42. *Sketch-Maps. Presented by the Author.*

Historical—Map. *B.R.S.G. Madrid* **44** (1902): 634–638. **Vera.**

Un mapa-mundi español del siglo XVI. Por Vicente Vera.

On the map lately discovered by Mr. Voynich (see *Journal*, vol. xx. p. 345), with notes on Spanish map-makers of the century.

Historical—The East. **Marquart.**

Osteuropäische und ostasiatische Streifzüge. Ethnologische und historisch-topographische Studien zur Geschichte des 9. und 10. Jahrhunderts (ca. 840–940). Von J. Marquart. Leipzig: T. Weicher, 1903. Size 9 × 6, pp. l. and 558. *Price* 30*s.*

History of Geography. **Berger.**

Geschichte der wissenschaftlichen Erdkunde der Griechen. Von Hugo Berger. Zweite Auflage. Leipzig: Veit & Co., 1903. Size 9½ × 6½, pp. iv. and 662.

See note, *ante*, p. 695.

BIOGRAPHY.

King. **[Walcott.]**

Necrology. Clarence King. (Twenty-third Annual Report of the United States Geological Survey. Washington, 1902. Pp. 198–206.) *Portrait.*

Schurtz. *Deutsch. G. Blätter* **26** (1903): 51–63. **Ratzel.**

Heinrich Schurtz. Von Prof. F. Ratzel.

H. Schurtz was born in 1863, and died in May, 1903. He was formerly a pupil of Prof. Ratzel, and was a copious writer on subjects connected with Anthropogeography.

Sprengel. *M.V. Erdk. Halle* (1903): 1–56. **Hänsch.**

Matthias Christian Sprengel, ein geographischer Publizist am Ausgange des 18. Jahrhunderts. Von Dr. B. F. Hänsch.

GENERAL.

Belgian Geographical Society.

La Fondation de la Société Royale Belge de Géographie et son XXV^me^ Anniversaire. Bruxelles: 1903. Size 10 × 6½, pp. 188. *Portraits. Presented by the Société Royale Belge de Géographie.*

Missionary Report.

Proceedings of the Church Missionary Society for Africa and the East. One hundred and fourth year, 1902–1903. Containing the Anniversary Sermon by the Right Rev. Francis James Chavasse, D.D., The Annual Report of the Committee. London, 1903. Size 8½ × 5½, pp. xcvi., 72, and 426. *Maps. Presented by the Church Missionary Society.*

Mosquitoes. **Theobald.**

A Monograph of the Culicidæ, or Mosquitoes. Mainly compiled from the collections received at the British Museum from various parts of the world in connection with the Investigation into the cause of Malaria conducted by the Colonial Office and the Royal Society. By Fred. V. Theobald. Vol. iii. London: British Museum (Natural History), 1903. Size 8½ × 5½, pp. xviii. and 360. *Plates, Diagram, and Illustrations. Presented by the Trustees, British Museum.*

Tsetse-Fly. **Austen and Hansen.**

A Monograph of the Tsetse-Flies. [Genus Glossina, Westwood.] Based on the Collection in the British Museum, by Ernest Edward Austen; with a chapter on mouth-parts by H. J. Hansen. London: British Museum (Natural History). 1903. Size 10 × 6, pp. x. and 320. *Map, Plates, and Illustrations. Presented by the Trustees, British Museum.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Denmark. **Danish General Staff.**

Generalstabens topografiske Kaart over Danmark. Scale 1:40,000 or 1·5 inch to a stat. mile. Sheets—Frederikshavn, Hörmsted, Hjöring, Aalbæk, Iversted, Hirshals, Skagen, Læsö N.V.D., Læsö N.Ö.D., Læsö S.V.D., Læsö S.Ö.D. Copenhagen, 1903. *Presented by the Danish Government.*

England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts vii., viii., ix., and x. Edinburgh: John Bartholomew & Co. Under the patronage of the Royal Geographical Society, 1903. *Price* 2*s.* 6*d. each part. Presented by the Publishers.*

The following are the contents of these parts:—Part vii. Text—The Cartography of England and Wales. Plates: 4, Monthly Rainfall Maps; 5, Monthly Temperature Maps; 82, Plans of Newcastle, Hull, Bradford, and Leeds; 84, Plans of Bristol, Portsmouth, Plymouth, and Brighton.—Part viii. Sections of the 2-miles-to-an-inch map of England and Wales. Plates: 19, Whernside and Penyghent; 20, Ripon and Northallerton; 21, Scarborough; 22, Hull and Hornsea.—Part ix. Plates: 38, Carnarvon; 39, Aberystwith; 77, New Quay and Bodmin; 78, Lands End and Falmouth.—Part x. Taunton and Exmoor. Plates: 67, Ilfracombe and Barnstaple; 75, Dartmoor and Torquay; 76, Bodmin and Plymouth.

This list of maps of England and Wales, which Mr. Bartholomew gives in Part vii., contains the titles of the more important maps from the earliest times to the present date, and will be useful for reference, especially as the library where each map can be consulted is stated. The meteorological maps in the same part are also worthy of special attention.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1903.

2 miles to 1 inch:—

Printed in colours, 62, 80, 82, 98, 1*s. each*; folded in covers or flat in sheets.

1 inch:—

(First revision) with hills in brown or black, 10, 32, 33, 39, 40, 42, 59, 61, 67, 1*s. each* (engraved).

(Second revision) in outline, 267, 283, 300, 302. 1*s. each* (engraved).

Printed in colours (74 and 83, part of) (combined). 1*s.*

6-inch—County Maps (first revision):—

Cambridgeshire, 47 S.E., 54 S.E., 57 S.W., 58 S.W. **Dorsetshire,** 29 S.W. **Gloucestershire,** 24 N.W., 25 N.W., 26 N.E., 31 N.E., 39 N.E., S.E., 40 S.E., 42 N.W., 47 S.E., 51 N.E., 58 N.W., 64 N.W., 67 S.W., 69 N.W., N.E., 70 N.W., 73 N.E. **Leicestershire,** 24 S.W., 28 N.W., S.E., 29 N.W., 34 N.E., 35 N.W., N.E., 36 N.W. **Radnorshire,** 15 N.E. **Shropshire,** 52*a* N.W., 70 S.W., 71 N.W., 73 S.W., S.E., 76 N.E. **Somersetshire,** 7 S.E., 12 N.W., 13 S.W., 17 N.W., 18 S.E., 73 N.W., 87 N.W., S.E. **Staffordshire,** 49 S.W., 59 S.E., 60 N.W., 61 N.E., S.E., 65 N.E., 67 S.W. **Warwickshire,** 2 S.E., 3 N.W., S.E., 5 N.E., 6 N.E. **Wiltshire,** 12 N.W., 18 N.E. **Worcestershire,** 9 N.E., 21 N.E., 22 N.E. (First revision of 1891 survey), **Yorkshire,** 284 S.W. 1*s. each.*

25-inch—County Maps (first revision):—

Dorsetshire, V. 12, 14, 16; XI*a*. 16; XX. 8, 10; XXVII. 4, 16; XXVIII. 1, 2, 5, 6, 9, 10, 11, 13, 14, 16; XXIX. 5; XXXVII. 2, 7, 10. **Gloucestershire,** XXIV. 7; LXVII. 2, 6, 7; LXXII. 9, 10, 11, 15; LXXIII. 1, 9, 13; LXXV. 4. **Herefordshire,** II. 8, 9, 13, 15, 16; III. 9, 13, 14, 15; V. 4, 8, 12, 15, 16; VI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15; VII. 2, 3, 5, 6, 7, 8, 9, 10; VIII. 5; X. 6, 7, 8; XI. 1, 3, 6, 9; XIV. 10. **Leicestershire,** XI. 15, 16; XII. 4, 8, 12; XVII. 12; XVIII. 3, 4, 6, 8, 12, 15, 16; XIX. 2, 5, 6; XXV. 15; XXIX. 15; XXX. 12, 14, 15, 16; XXXIV. 6, 11, 15, 16; XXXVI. 4, 8; XLI. 4; XLII. 4, 6; XLIII. 5, 13; XLVIII. 6, 15. **Radnorshire,** V. 13; IX. 3; X. 1, 6, 11, 12, 16; XI. 13; XII. 9, 13; XV. 1; XVII. 1, 4, 6, 7, 8, 10, 12, 14, 15, 16; XVIII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16;

XIX. 1; XXIV. 4, 8; XXV. 5, 6, 7, 8; XXVI. 1. **Shropshire,** LXXI. 13, 14, 15; LXXII. 9, 10, 12; LXXVII. 1, 9, 13; LXXVIII. 9, 14, 15; LXXIX. 12; LXXX. 3, 4, 7, 9; LXXXI. 1, 2; LXXXII. 2, 3, 7, 8; LXXXIII. 5. **Somersetshire,** I. 12, 15, 16; II. 5, 6, 9, 13, 14; IV. 3, 4, 8, 10, 11, 12, 14, 15, 16; V. 1, 2, 9, 10, 13, 14; XI. 1, 7, 8, 10, 11, 13, 14, 15; XVIII. 1, 2, 3, 4, 5, 7, 10, 14; XXVIII. 1, 2, 10, 13, 14; LIII. 1, 3, 5, 11, 15, 16; LV. 9, 14; LXIV. 4, 8; LXV. 5, 16; LXVI. 1, 9, 13; LXXII. 14; LXXIV. 3, 4, 9, 10, 13; LXXV. 4, 5, 11, 12; LXXX. 5, 10, 12, 13, 14, 16; LXXXI. 1, 2, 3, 4, 5, 6, 8, 9, 13; LXXXIII. 14; LXXXVIII. 9, 10, 11, 14, 15; LXXXIX. 16; XCV. 4. **Staffordshire,** LXIV. 14; LXVI. 6, 8, 10, 13, 14; LXXV. 1. **Warwickshire,** IV. 14, 16; V. 15; VI. 6, 11, 14, 15, 16; VIII. 4; IX. 2, 4, 6, 7, 8, 10, 11, 12, 14, 16; X. 4, 7, 8; XI. 5, 6; XII. 13; XVIII. 6, 15. **Worcestershire,** IX. 1; XIX. 3, 6, 7, 10, 11; XX. 2, 3; XXI. 5, 9, 14; XXVIII. 2. **Yorkshire,** CCLXXXIII. 7; CCLXXXV. 3, 5, 7; CCLXXXVII. 4; CCLXXXVIII. 1, 5, 9, 13; CCLXXXIX. 11; CCXCIII. 4, 8, 12; CCXCV. 3, 11. **3s.** *each.*

England and Wales. **Geological Survey.**

1-inch scale (New series). Colour-printed.

Solid edition (261 and 262). **1s. 6d.**

(*E. Stanford, London Agent.*)

Netherlands. **Geest.**

Het Koninkrijk der Nederlanden. Naar de Topografische kaart (1 : 50,000) en andere nieuwe bronnen ontworpen en geteekend door E. De Geest. Scale 1 : 300,000 or 4·7 stat. miles to an inch. 2 sheets and index. Amsterdam: Seyffardt's Boekhandel, 1903.

Novaya Zemlya. **Borissow.**

Borissows Aufnahmen in Nowaja Semlja im Winter 1901–2. Scale 1 : 300,000 or 4·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrang 1903, Taf. 22. Gotha: Justus Perthes. ***Presented by the Publishers.***

ASIA.

Asia. **Stanford.**

A map of the countries between Constantinople and Calcutta, including Turkey in Asia, Persia, Afghanistan, and Turkestan. Scale 1 : 6,969,600 or 110 stat. miles to an inch. London: Edward Stanford, 1903. *Price* 7*s.*

Stanford's Map of the Empires of China and Japan, with the adjacent parts of the Russian Empire, India, Burma, etc. Scale 1 : 6,969,600 or 110 stat. miles to an inch. London: Edward Stanford, 1903. *Price* 8*s.*

These two maps, taken from Stanford's library map of Asia, together extend from Constantinople to Japan. To a certain extent they overlap, the northern part of India being given on each map. Railways, working and proposed, are clearly shown in red, political boundaries are coloured, and other information is given that will render the maps useful for general reference in connection with all matters connected with the Far East.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 9 S.W., parts of district Hyderabad and Native State of Khairpur (Sind, Bombay Presidency), additions to 1901. 22 N.E., parts of districts Ahmedabad, Kaira, and Panch Mahals, of Native State Baroda, and of Mahi Kantha, Rewa Kantha, and Kathiawar Agencies (Bombay Presidency), additions to 1902. 37 S.W., parts of districts Surat, Khandesh, and Nasik, Rewa Kantha, Surat, and Khandesh Agencies, and Native State Baroda (Bombay Presidency), additions to 1900. 49 S.E., parts of districts Gurgaon and Delhi (Punjab), Meerut, Bulandshahr, Muttra, Aligarh, and Moradabad (United Provinces of Agra and Oudh), additions to 1901. 60 S.E., parts of districts Mysore, Bangalore, Tumkur, and Kolar (Mysore), and of Salem and Coimbatore (Madras Presidency), additions to 1898. 67 N.E., parts of districts Bareilly, Naini Tal, Almora Pilibhit, and Kheri (United Provinces of Agra and Oudh), and Nepal (Native State), additions and corrections to 1902. 79 N.E., Pondicherri (French Territory), and parts of districts South Arcot, Tanjore, and Trichinopoli (Madras Presidency), 1903. 87 N.E., parts of districts Gonda, Bahraich, Basti, and Gorakhpur (United Provinces of Agra and Oudh), additions to 1901. 178 N.W., parts of district Mergui (Burma), 1903. 61, parts of districts Malabar, Coimbatore, Madura, and Salem (Madras Presidency), and of district Mysore (Mysore Native State), and Coorg, additions to 1902. 94, parts of districts Khamamet (Nizam's Dominions), of Kistna, Godavari, and Vizagapatam (Madras Presidency), and Bastar State

(Central Provinces), additions to 1900. 104, parts of districts Mirzapur (N.W. Provinces), Shahabad, Gaya, Hazaribagh, Ranchi, Palamau, and Sarguja State (Bengal), additions to 1902. 121, district Howrah and parts of districts 24 Parganas, Burdwan, Khulna, Nadia, Jessore, Faridpur, Backergunge, Midnapore, and Hooghly (Bengal), with additions to 1901.—Burma Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 467 (N.S.), district Tavoy, Season 1891-93, 1901; 509 (N.S.), part of Southern Shan States, Season 1900-01, 1902; 541 (569 O.S.), district Mergui, Season 1890-91, 1901.—Central India and Rajputana Survey, 1 mile to an inch. Sheets: 209, parts of Banswara, Partabgarh (Rajputana Agency), and of Gwalior, Jaora, Rutlam, and Sailana (Central India Agency), Seasons 1879-81, 1901; 412, part of Gwalior (C.I.A.), Season 1862-63, with additions to roads and railways from extra departmental sources to September, 1902, 1903.—Madras Survey, 1 mile to an inch. Sheets: 29, parts of districts Hassan and Kadur (Mysore) and South Canara (Madras), Season 1879-81, with additions and corrections to February, 1890, 1902; 79 and 80, part of district Mysore (Mysore), Season 1884-85, with additions and corrections to 1902; 105, parts of districts Bangalore, Kolar, and Tumkur (Mysore), Season 1877-79, with additions to boundaries, railways, and roads from extra departmental source to July, 1890, 1903; 107 and 108, parts of districts Mysore, Bangalore, and Tumkur (Mysore), Season 1883-84, with additions and corrections to 1896, 1902; 109, parts of districts Bangalore and Mysore (Mysore), Season 1883-84, with additions and corrections to 1900, 1902; 137 and 171, parts of districts Bangalore and Kolar (Mysore), Seasons 1877-79, 1885-86, with additions and corrections to 1898, 1903; 172 and part of 204, parts of districts Kolar (Mysore) and Salem (Madras), Season 1885-86, with additions and corrections to July, 1899, 1902.—Punjab Survey, 1 mile to an inch. Sheets: 110, 111, 138, district of Rawulpindi, 1902; 164, 165, 188, 189, district of Jhilam, 1902; (Second Edition) 290, districts Hoshiapur, Umballa, and Simla, Patiala and Simla Hill States, Season 1886-89, 1903.—Punjab and United Provinces of Agra and Oudh Surveys, 1 mile to an inch. Sheet (Second Edition) 315 (Punjab), 2 (U.P.A. & O.) districts Umballa and Karnal and Kalsia State (Punjab), and district Saharanpur (U.P.A. & O.), Seasons 1878-80 and 1886-88, 1902.—Sind Survey, 1 mile to an inch. Sheet (Second Edition) 38, districts Shikarpur, Upper Sind Frontier, and Larkhana, and part of Kalab (Baluchistan), Seasons 1897-98 and 1899-1900, 1902.—South-Eastern Frontier, 4 miles to an inch. Sheet 12 N.W., China, Yün-nan Province, Seasons 1894-95, 1898-1900, 1902.—United Provinces of Agra and Oudh Survey, 1 mile to an inch. Sheet 16, districts Muzaffarnagar and Meerut, Seasons 1878-80, with additions and corrections to canals and boundaries, etc., up to February, 1902.—North-Western Provinces and Oudh Survey, 1 mile to an inch. Sheets: 86 (Preliminary Edition), district Shahjahanpur, Season 1895-96, 1902; 175 (Second Edition), districts Basti and Gonda, Seasons 1883-87 and 1900-01, 1902.—United Provinces of Agra and Oudh and Central India and Rajputana Surveys, 1 mile to an inch. Sheet 24 (U.P.A. & O.), 360 (C.I. & Raj.), districts Muttra, Agra, and Aligarh (U.P.A. & O.), Bharatpur State (C.I. & Raj.), Seasons 1856-58, 1871-73, and 1874-75, with additions to railways, roads, etc., up to April, 1898, 1902.—Western Bengal, 8 miles to an inch. Sheet: 10, containing districts Cuttack and Puri, and part of the Tributary States, with additions and corrections up to April, 1902, 1903.—Eastern Bengal, 8 miles to an inch. Sheet 11, parts of districts Darjiling, Jalpaiguri, and Goalpara, with Nepal, Sikkim, and Bhutan, with addition of railway and correction to boundaries to 1901, 1903.—District Ahmednagar (Bombay Presidency), 4 miles to an inch, 1903.—District Purnea (Lower Provinces, Bengal), 4 miles to an inch, with additions and corrections to boundaries, roads, and railways up to February, 1902, 1903.—Central Indian Agency, 80 miles to an inch, 1902.—District Jalaun (U.P.A. & O.), 8 miles to an inch, corrected up to 1901, 1903.—District Nadia (Bengal), 8 miles to an inch, corrected up to 1901, 1903.—District Pabna (Bengal), 8 miles to an inch, corrected up to 1901, 1902.—District Saran (Bengal), 8 miles to an inch, corrected up to 1902, 1903.—Survey of India Chart of Triangulation, 8 miles to an inch. Sheet 21 N.W. (North-Western Trans-Frontier Series), Season 1880-81, 1902.—Index to the Standard Sheets of Bengal, 50 miles to an inch, additions to 1901.—Index to the Standard Sheets of the Bombay Presidency, 65 miles to an inch, additions to 1901.—Index to the Degree Sheets of Burma, 65 miles to an inch, 1903.—Index to the Standard Sheets of Burma (New Series), 64 miles to an inch, additions and corrections to boundaries, etc., up to 1902, 1903.—Andaman Survey, 2 miles to an inch. Sheets: 1, part of South Andaman, Season 1885-86, 1902; 3 and 11, Little Andaman, Seasons 1885-87, 1903; 5 and 6, North Andaman, Season 1885-86, 1902; 7, part of North and Middle Andaman, Season 1885-86, 1902; 8, South and Middle Andaman, Season 1884-85, 1902; 9,

South Andaman, Season 1883–86, 1902; 10, part of South Andaman, Season 1885–1886, 1902.—Assam Survey, 1 mile to an inch. Sheets: 50 (Preliminary Edition), districts Darrang and Nowgong, Seasons 1886–87, 1891–92, 1897–98, 1902; 60 (Preliminary Edition), district Darrang, Seasons 1891–92, 1897–98, 1902; 117 (Preliminary Edition), district Sibsagar, Season 1889–90, 1903.—Bengal Survey, 1 mile to an inch. Sheets: 191, district Balasore, Season 1892–93, 1903.—Bengal and United Provinces of Agra and Oudh Surveys, 1 mile to an inch. Sheet: 51 (Bengal), 213 (U.P.A. & O.), districts Champaran (Bengal) and Gorakhpur (U.P.A. & O.), Seasons 1886–87 and 1894–96, 1902.—Bombay Survey, 1 mile to an inch. Sheets: 146, parts of Ahmedabad District and Mahi Kantha and Rajputana Agencies, Season 1888–89, with additions to railway, 1898, 1902; 164, district Thana, Season 1880–81, corrected to May, 1897, 1902; 195, districts Poona, Ahmednagar, and Thana, Seasons 1877–80, with additions and corrections to forest boundaries up to November, 1898, 1901; 202, districts Ratnagiri and Satara, Season 1882–83, corrected up to April, 1899, 1901; 248, district North Kanara, Season 1896–97, 1903; 258, district Nasik, Season 1873–74, with additions to railways up to 1900, 1903; 287 and 288, part of Khandesh, Season 1881–82, 1901; 328, district Bijapur, Jamkhandi, and Aundh States, Season 1895–96, 1901.—Burma Survey, 1 mile to an inch. Sheets: 73 (Preliminary Edition), 90 (Old Series), district Minbu, Seasons 1892–93, 1896–98, 1901; 111 (Preliminary Edition, New Series), districts Minbu and Magwe, Seasons 1891–3, 1894–95, 1902; 140, 141, and 188 (Preliminary Edition; New Series), district Katha, Seasons 1893–94 and 1896–97, 1903; 143 (Preliminary Edition, New Series), district Shwebo, Seasons 1892–96, 1901; 161 (Second Edition), 179 (Old Series), parts of districts Prome and Thayetmyo, Seasons 1882–93 and 1898–1901, 1903; 237 and 238 (New Series), parts of districts Shwebo, Ruby Mines, and Northern Shan States, Season 1900–01, 1903; 246 (Second Edition), parts of districts Meiktila, Kyaukse, and Southern Shan States, Seasons 1889–91 and 1898–1901, 1903; 250 (Preliminary Edition, New Series), district Yamethin and Southern Shan States, Seasons 1894–97 and 1900–01, 1902; 301 (Preliminary Edition, New Series), districts Tungu, Seasons 1897–99, 1901; 438 (New Series), parts of Northern and Southern Shan States, Season 1900–01, 1902. *Presented by H.M. Secretary of State for India, through the India Office.*

Indo-China. **Bureau Topographique des Troupes de l'Indo-Chine.**

Carte de l'Indo-Chine. Scale 1:500,000 or 7·8 stat. miles to an inch. Sheets: Cao Bang, Hanoi, Luang Prabang. Bureau Topographique des Troupes de l'Indo-Chine. *Price* $0.60 *each sheet.*

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1: 250,000 or 3·9 stat. miles to an inch. Egyptian Sudan. Sheets (Provisional): 66-O, Nasser; 66-P, Goré; 78-C, Akobo. Corrections to September, 1903. London: Intelligence Division, War Office; Stanford. 1903. *Price* 1*s.* 6*d. each sheet. Presented by the Director-General of Mobilisation and Military Intelligence.*

These are new editions corrected up to September, 1903.

East Africa. **Wickenburg.**

Graf Eduard Wickenburgs Reiserouten in Ost-Afrika 1901. Scale 1:1,000,000 or 15·8 stat. miles to an inch. Blatt. iv. and v. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Taf. 19 and 20. Gotha: Justus Perthes. *Presented by the Publishers.*

These two sheets show that part of Count E. Wickenburg's journey through British East Africa from 4° N. lat., east of Lake Rudolf, southward to the Tana river just above Borati. A great part of the country traversed was previously unexplored, and Count Wickenburg's surveys are therefore important.

Kamerun. **Moisel.**

Das nordwestliche Grenzgebiet von Kamerun zwischen Rio-Del-Rey und Bali. Nach den neuen Aufnahmen von Hauptmann Glanning, Hauptmann Ramsay, Oberleutnant Lessner, Bezirksamtmann Dr. Meyer, Oberleutnant Strümpell und Leutnant Buthut (1900–1902) und dem gesamten älteren Material, bearbeitet von Max Moisel. Scale 1:259,000 or 3·9 stat. miles to an inch. Two Sheets. Berlin: Dietrich Reimer (Ernst Vohsen).

This map is based upon the recent explorations and surveys of German officers, combined with those of earlier travellers, and gives a good idea of what is at present

known of the north-west boundary region of Kamerun. It is well drawn, and printed in colours.

Orange River Colony. **Duncan.**

Divisional Maps of the Orange River Colony. Scale 1 : 148,705 or 2·3 stat. miles to an inch. Compiled by A. H. Duncan for the Orange River Colony Surveyor-General's Office, Bloemfontein. April, 1902. Sheets: Bloemfontein, Kroonstad. Bloemfontein and London: Argus Printing & Publishing Co. *Price 7s. 6d. each sheet.*

These sheets have been compiled in the Surveyor-General's Office, Bloemfontein, from the farm surveys published by the Government of the late Orange Free State, together with those of more recent date by British officers and all other available material. They form part of a large map of the Orange River Colony in twenty-three sheets, of which eighteen are now ready. Besides giving information respecting the areas and boundaries of farms, rivers and streams are shown in blue, and hills in brown horizontal hachures. The sheets are lithographed by the Argus Company, Bloemfontein, and can be obtained from the offices of that company in London at prices varying from 7*s.* 6*d.* to 10*s.* 6*d.* each. Later on a more complete survey will doubtless be undertaken, but for the present this map will be of great service and importance.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Turtle Mountain Sheet (17), West of Principal Meridian, revised to August 14, 1903; Sullivan Lake Sheet (69), West of Fourth Meridian, revised to April 30, 1903; Calgary Sheet (83), West of Fifth Meridian, revised to June 4, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

These sheets are new editions revised up to the present year. They show trails, post-offices, townships, railways, and stations.

United States. **Boston and Maine Railroad.**

Bird's-Eye View from Summit of Mount Washington, White mountains, New Hampshire. A coloured lithograph issued by the Passenger Department, Boston and Maine Railroad, Boston, Mass. *Presented by E. G. Buttrick, Esq.*

GENERAL.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich, 23 and 24 Lieferung. Gotha: Justus Perthes. *Price 60 pf. each part.*

Two parts in one cover, containing (Nos. 29 and 30) the south-west and south-east sheets of a four-sheet map of France on the scale of 1 : 1,500,000, which have been revised, and Nos. 46 and 47, two sheets of a new map of European Russia, on the scale of 1 : 3,700,000, by H. Kehnert and W. Habenicht.

CHARTS.

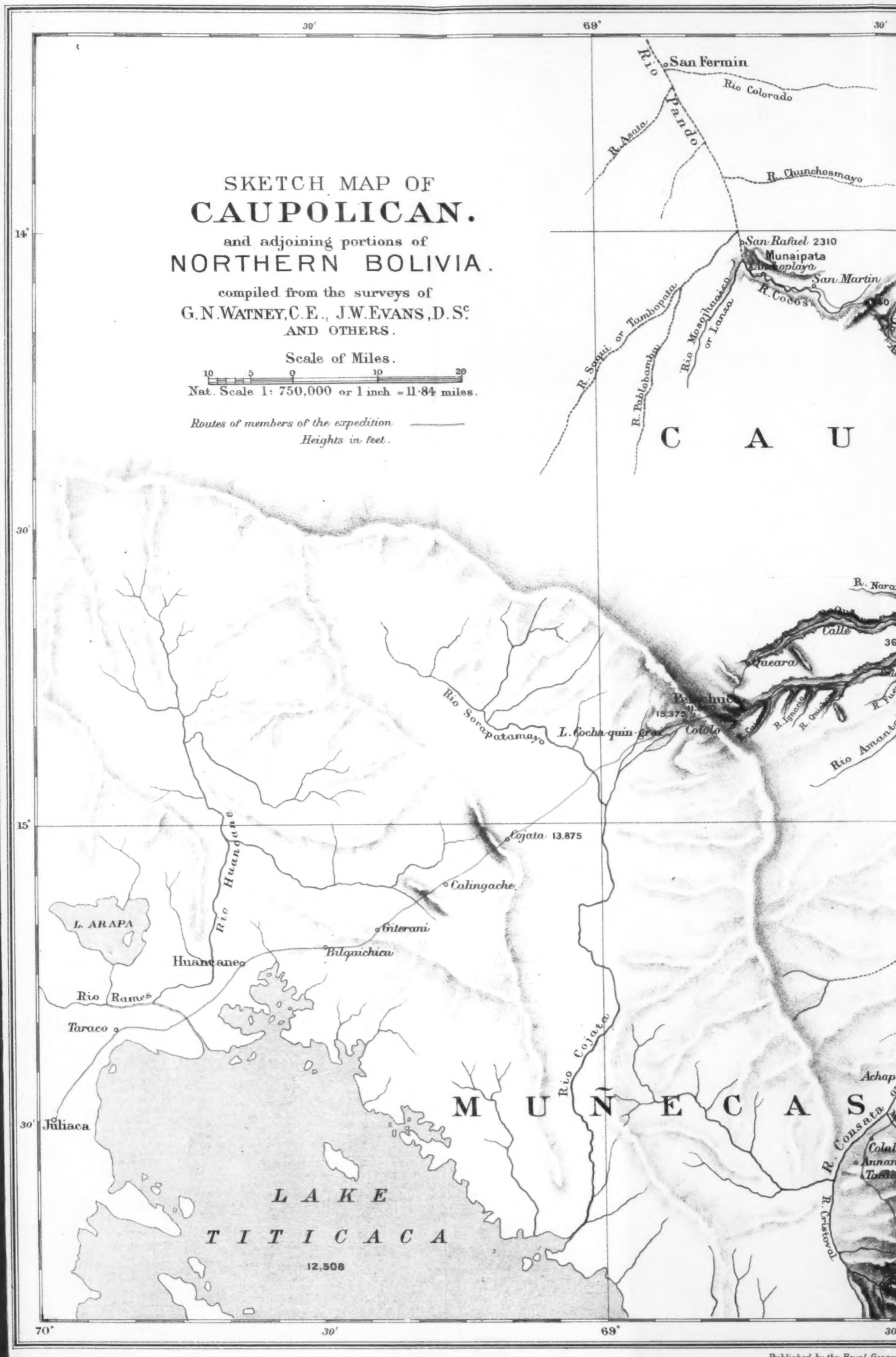
North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for November, 1903. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for October and November, and of the North Pacific for November, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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68°
30'
14°
15°
30'
Rio Beni
Rio Tequeje
Rio Enapurera
Rio Tareni
Rio Enadere
Rio Yuyapi
Rio Yariapo
Rio Hondo
Rio Eslabon
Rio Tuiche
Rio Hondo or Erasama (Apichana)
Rio Yuyo or Green R.
Rio Camata
Rio Beni, Bopi or De la Paz
Rio Cusali Range
Rio Coroico
Rio Zongo
Bala - Susi
Susi Ridge
Bala Ridge
Chepite Range
Beu Range
Cusali Range
Eslabon Ridge
Mt. Caquiahuaca 5000
Yuromo
San Jose 1582
Humupasa 1435
Mts
Ixiamas 730
San Juan 3255
Buturo 2295
Ipurama 3810
Tigrepata 5025
Mt. Giteranipata
Pajonale Grande 7095
Parajso 5370
Mt. Husina Jatunari
Mt. Macho Jatonari 5940
Mamacona
Apolo 4550
Santa Cruz 500
Mojos
Pata
Sta Barbara
Anilla
Naranjani
Sta Teresa
Pto Salinas
Reyes
Alta marani
Rurenabaque
San Buena Ventura
Susi Gorge
Bala Gorge
Mapiri 1610
Chaquimpampa
Anselmo
Helena
Chatumhuanja
Pelini
Chinchillo
Achapampa
Colabamba
Annania
Tipuani 1820
Huanani 3450
Suruta 4320
Sumaco
La Joya 5330
Puri
Mariara
Mapiripe
Ancahuara
Tapacari
Inglis Inglis
Sal Puna
Achicheri
Nueva Brasil
San José
Chumalora
Mella Vista
Ulla Ulla
Tumupasa
Saiyaba
Sapati
Ulimo Vado
Bibiri
Cumplaya
Iquamalla 3940
Ucumari
Huajanai
Jatuncama
Toro Pauchinta Falls
R. Sachiaqui
R. Techiapo
R. Esellioma
R. Ipurama
R. Jabatretuti
R. Tori
R. Machariapo
R. Turiapo
R. Chaparo
R. Yuruma
R. Chiarra
R. Sasaru
R. Quendeque (Inbiguo or Yuyo-uco)
R. Sama
R. Suapi
R. Chepite
R. Alten
R. Challana
R. Huichi
R. Yara
R. Maiher
R. Uyapi
R. Chamari
R. Sarampiono
R. Arma
R. Tuichi
R. Quiquivé
Beu (Graz Tumsi)
Huarubuma
Hanani
Tapacari
Tipuani
Huanani
Suruta
Sumaco
La Joya
Puri
Mapiripe
Ancahuara
Mariara
Colabamba
Annania
Tiquina
Inquisivi
Ulla Ulla
Pelini
Chinchillo
Achapampa
Mapiri
Chatumhuanja
Helena
San José
Anselmo
Chumalora
Nueva Brasil
Achicheri
Sal Puna
Inglis Inglis
Ucumari
Huajanai
Jatuncama
Anilla
Naranjani
Mojos
Pata
Sta Barbara
Apolo
Santa Cruz
Tigrepata
Parajso
Mamacona
Mt. Giteranipata
Pajonale Grande
Mt. Husina Jatunari
Mt. Macho Jatonari
Buturo
San Juan
Toro Pauchinta Falls
Ixiamas
Yuromo
San Jose
Mt. Caquiahuaca
Humupasa
Saiyaba
Sta Teresa
Pto Salinas
Reyes
Alta marani
Rurenabaque
San Buena Ventura
Susi Gorge
Bala Gorge
Susi Ridge
Bala Ridge
Chepite Range
Beu Range
Cusali Range
Eslabon Ridge
Mts
Rio Beni
Rio Tequeje
Rio Enapurera
Rio Tareni
Rio Enadere
Rio Yuyapi
Rio Yariapo
Rio Hondo
Rio Eslabon
Rio Tuiche
Rio Hondo or Erasama (Apichana)
Rio Yuyo or Green R.
Rio Camata
Rio Beni, Bopi or De la Paz
Rio Cusali Range
Rio Coroico
Rio Zongo
Bala - Susi

NORTH POLE
SKETCH MAP
to illustrate the
NORTH POLAR EXPLORATIONS
OF
COMMANDER R. E. PEARY, U.S.N.
Under the auspices of the Peary Arctic Club.
Scale of Miles.
0 50 100 150
Nat. Scale 1: 5,000,000 or 78·9 stat. miles to 1 inch.
Surveys of New Coast Line
Resurveys of Coast Line 1898 to 1902
Routes 1898 to 1902
Routes on Inland Ice
Supply Caches.
Peary's Farthest North 84° 17' April 21, 1902.
Markham 1876
Aldrich 1876
Challenger Mt.
Grant Ld
Clements Markham Inlet
Feilden Pen.
Black C.
United States
Fr. Conger Winter Qrs. 1900-01
L. Hazen
Grinnell Land
Dodge R.
Archer Fd.
GREELY FIORD
Cannon B.
C. Lockwood
Carl Ritter B.
C. Lawrence
Rawlings B.
C. Joseph Good
HENNEDY CHANNEL
C. Constitution
C. Calhoun
Peterman Fiord
Mt. Moore
Dobbin B.
C. D'Urville Winter Qrs. 1898-99
Princess Marie B.
Flagler Bay
Bache Penn.
C. Fraser
C. Forbes
Peabody
Humboldt
Glacier
KANE BASIN
Bay
Brooks I.
Hall B.
Payer Hr.
Winter Qrs. 1901-02
C. Albert
Buchanan B.
C. Sabine
C. Russell
Dallas B.
C. Isabella
Erik Hr.
Etah Winter Qrs. 1899-1900
SMITH SOUND
ELLESMERE
C. Robertson
Inglefield Gulf
Clarence Hd.
C. Parry
Whale Sd.
Hakluyt I.
Victoria Head
Kane Basin Glacier
Hakluyt Island
Victoria Head
Kane Basin Glacier
Hakluyt Island
Victoria Head
Kane Basin Glacier
Hakluyt Island

ographical Society.

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11
12
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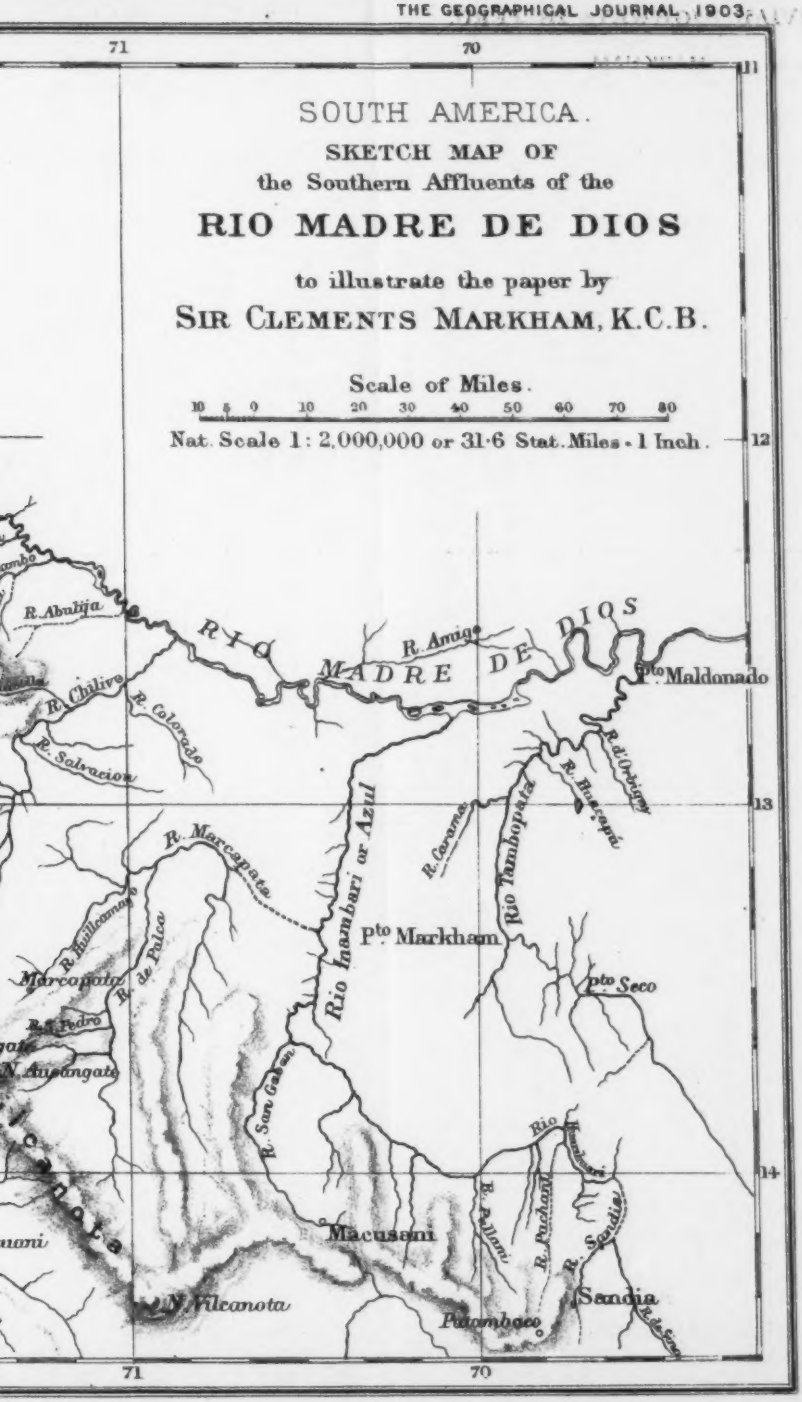
14
R. Misahua
R. Camisea
R. Cashpajali
R. Tayali
Fiscarrald Isthmus
Rio Manu
Rio Urubamba
Rio Yavero
Rio Yanatili
Rio Paucartambo
Codo
Pinqui
R. Paucartambo
Soiri
Rosalina
Ocobamba
Sta Ana
Cordillera
R. Paripini
R. Tono
R. Yanamaya
R. Marcapata
Urubamba
Calca
Paucartambo
Anta
CUZCO
Urcos
R. Mercachea
Ocongate
R. Ficcinaya
Sicuani
Published by the Royal Geogra



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